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THE JOURNAL OF LAND & PUBLIC UTILITY ECONOMICS

Land Prices in a Commodity Price System
PHILIP H. CORNICK

"Ready-Made" Consumer Analyses
JAMES J. HANKS

Erosion and Land Utilization in Wisconsin
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Real Estate Activity in California
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Utility Regulation in the State of Washington
JAMES K. HALL

VOLUME X NUMBER 3 AUGUST, 1934 PRICE $1.25 A COPY

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THE JOURNAL OF LAND & PUBLIC UTILITY ECONOMICS

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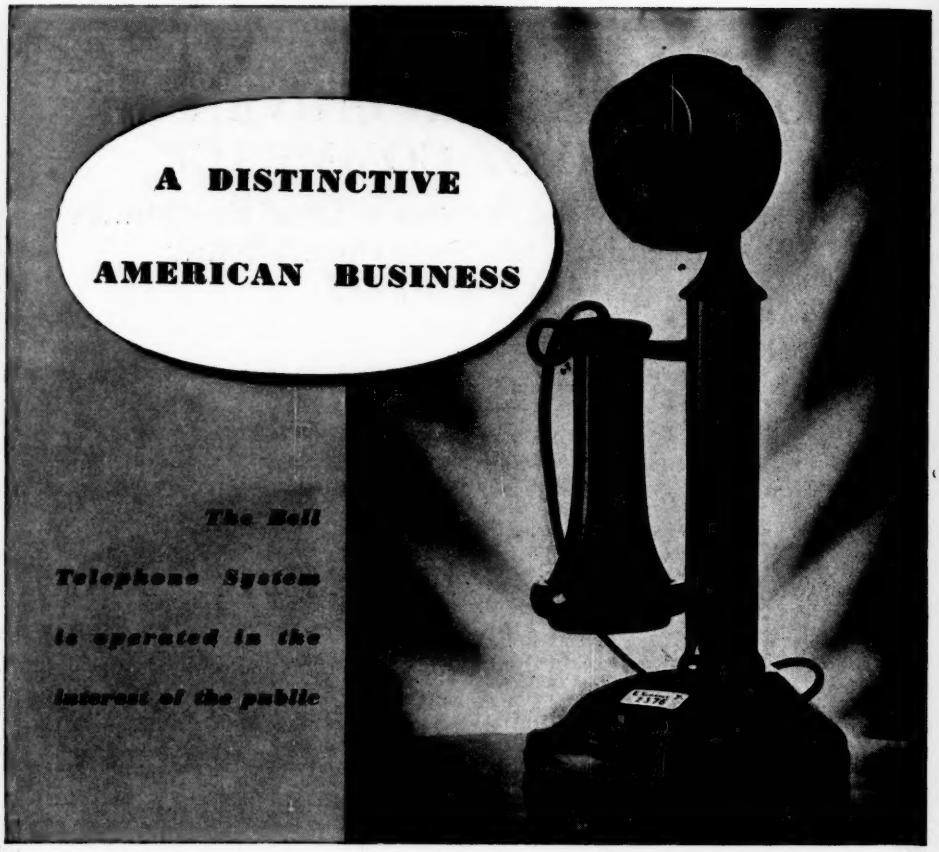

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Land Prices in a Commodity Price System

By PHILIP H. CORNICK

MANY economists have shown us that each of the series of world-wide and shattering declines in commodity prices has followed closely upon the heels of a dislocation in the normal processes of production and consumption engendered by a major war—the Napoleonic wars, the American Civil War, and the World War. The three gothic spires which appear on any chart of the commodity price index for the past century and a quarter afford mute evidence of that fact. Too little attention, perhaps, has been paid by students to the successive elevated plateaus at which the price indices showed marked tendencies to stabilize, following the declines from the war peaks; or to the reasons why the indices of volume of production stood above the so-called normal line during the period of these plateaus of high commodity prices. Furthermore, few if any of the commentators seem to have taken into account the fact that our price indices deal with commodities only—with freely reproducible and tangible goods whose consumption is essential to the maintenance of human life, welfare, and happiness, and which cannot be produced without the active intervention of human effort; while the price system, as at present constituted, operates to include also one basic element in production which is not a commodity, which has no cost of production or of reproduction, but which nevertheless is bought and sold for a price. That basic element in production is land.

The purpose of this article is to analyze the place of land and of land prices in a price system which has functioned more or less adequately throughout extended periods to bring the supply of commodities into equilibrium with demand. The method used in the inquiry will be frankly experimental. It will consist of advancing hypotheses, and then testing those hypotheses against such slender facts as are available. The tentative conclusions are to be considered primarily, therefore, as a plea for the collection of certain types of facts which have perhaps been too largely

ignored in the past, and for the arrangement of those facts in such a manner as to test the validity of the hypotheses advanced.

The Classic Theory of Prices

Whether price and value are synonymous is a question which in one form or another has engaged the attention of economists since the days of Adam Smith. While this discussion will deal exclusively with prices, it is interesting to note that two opposing theories of the relations between price and value have emerged, each of which in varying forms still has its ardent champions among the leaders both of academic thinking and of lay opinion. Reduced to their simplest terms, and stated in their most extreme forms, they are as follows: (1) a thing is worth what it will sell for; and (2) a thing is worth what it has cost to produce, or what it would cost to reproduce. So far as freely reproducible commodities are concerned, the gap between these two extremes has been bridged by the conventional demand-supply equation which postulates that, in a free market, the price at which a given commodity will sell is the cost of producing the last unit necessary to supply the demand.

The theory which underlies this equation has frequently been illustrated in the textbooks by the use of some such commodity as wheat. It takes into account the fact that, all other things being equal, costs of production per bushel vary on different tracts of land, either because of differences in fertility, or in the costs of transportation per bushel from farm to market, or both. By implication, therefore, it does more than simply provide a tenable explanation of the way in which costs of production at the margin of cultivation govern the prices of all wheat produced in a free market. The theory also offers a basis for a reasoned explanation of the way in which that marginal cost of production leads to variations in the prices of wheat land per acre, in spite of the fact that wheat land, from the standpoint of its inherent qualities, is not a commodity,[1] and has no cost of production. Since, under an assumed set of conditions, the cost of producing a bushel of wheat on a well located and fertile acre is below that which prevails on a marginal acre and which establishes the price for the entire crop, it follows that every acre above the margin must also have a net income in the form of land rent which can be capitalized into a warranted value or a justified price, to use the terms which have recently come to be widely used in the growing volume of writings by, and for, commercial appraisers of real estate.

Now how does this double-barreled theory of prices work in practice? Continuing the hypothesis of the free market, which is a basic part of the theory, obviously its operation imposes a definite economic check on the price of wheat. In a market operating under ideal conditions, the price of the crop as a whole can never be more per bushel than the cost of producing the last bushel required to equal the demand. If supply and demand remain in such equilibrium for a term of years as to maintain a stable price per bushel, we also have an economic check on the price of supermarginal wheat land. The net land rent for each acre will represent the difference between the price per bushel and the cost of production per bushel on that acre, multiplied by the number of bushels produced; the land price per acre will be that product capitalized at the prevailing rate of interest—a rate

[1] "Commodity" is used here to apply to everything movable that is bought and sold.

which is itself established by the price equation. In other words, to revert to the terminology of Adam Smith, the land will exchange for the equivalent in money, let us say, of 20, 30, or 40 years' purchase, depending on the rate of interest. This traditional method of land pricing has been reduced to formula by a number of writers, most of whom have stated it in terms of land value. Substituting the concept of price for that of value, the formula is as follows:

$$P \text{ equals } \frac{A}{R}$$

in which P represents the price of land, A the annual net land rent, and R the rate of capitalization.[2]

The Conventional Modification of the Theory of Land Prices

Let us now assume that we have a constantly increasing demand for wheat. Every year the margin of cultivation will be pushed out. Every year, as more remote or less fertile lands are brought into use, or as supermarginal producers resort to more intensive cultivation, the marginal cost of production which governs the price will be forced up. Under such conditions, the demand-supply equation still provides an economic check on wheat prices, but it tends to introduce a new factor into land prices. Lands will no longer be exchanged for the equivalent of so many years' purchase. For some two decades prior to 1920, the application of the traditional formula to the conditions which prevailed in the great farming regions of the Middle West could not be made to produce the prices at which farm lands were selling.

Among the group who contributed to the recent renewed interest in land economics, both L. C. Gray and W. I. King therefore suggested the use of an expanded formula containing one added factor—the anticipated future increase in annual net land rent. If we designate this new factor by I, the new formula may be stated as follows:

$$P \text{ equals } \frac{A}{R} \text{ plus } \frac{I}{R^2}$$

Clyde R. Chambers subsequently tested the validity of this expanded formula by applying it to observed rents per acre and prices per acre in seven of the farming states of the Middle West.[3] He succeeded in collecting data on the two related series of facts covering the period from 1900 to 1920; and their analysis and interpolation amply sustained the accuracy of that formula.

That being the case, what happens to the demand-supply equation during a period such as that which was subjected to test by Mr. Chambers? Let us assume first, that the free market for wheat continues. In that event, the cost of production at the margin of cultivation will still provide an economic check on the price of the supply as a whole. To that extent that part of the formula for computing land prices which is expressed by the term $\frac{A}{R}$ is also subject to economic checks because A is a function of the cost of producing the marginal bushel. The same statement, however, does not apply to the factor designated as I in the second part of that formula. The relative importance of that term in the formula as a whole is subjected to no economic controls whatsoever. The

[2] Other variables also enter into this equation and affect the result. For example, the competence of farm operators is one such variable which may influence both the A and the R of the formula. Space does not permit, however, an exhaustive discussion of this or other variables and how they may affect the factors mentioned here.

[3] "Relation of Land Income to Land Value," by Clyde R. Chambers, United States Department of Agriculture, *Department Bulletin 1224* (1924).

control is purely psychological. It is governed not by present facts but by estimates of future trends based on the projection of past trends. When, as happened between 1896 and 1914, the prices of farm products tended steadily upward, a larger and larger percentage of the total number of active farmers consisted year after year of individuals who had never experienced a prolonged period of declining prices. Those old men, who had lived through all or part of the long downward trend in crop prices which began in 1864 and continued until 1896, came to be looked on as old fogeys; their stories were discounted as tales of "old unhappy, far-off things." The faith that *I*, therefore, would always have a positive value became so firmly established in men's minds as a result of long experience, that not even conservative purchasers, or the most cautious appraisers for mortgage loans, questioned it.

The Effect of Agricultural Land Prices on the Prices of Farm Products

At the beginning of the preceding paragraph it was assumed that the demand-supply equation provides economic checks on wheat prices and on that segment of land prices represented by the capitalization of the net rent of supermarginal wheat land, provided that the free market for wheat, which is implicit in the theory on which that equation is based, continues. The ideally free market can, of course, never exist. The weather, among other things, will affect the cost of producing wheat both at the center and at the margin of cultivation, and the effects of the weather may vary widely from year to year, both throughout the wheat area as a whole, and from one part of the wheat area to another. Inertia, ignorance, and the lag in the accumulation and transmission of pertinent facts will militate against the perfect operation of a market both on the demand and on the supply side. During the concluding years of the period under consideration, a wholly abnormal market existed, attributable to the effects of the World War on both supply and demand. But even leaving these shortcomings of the actual as opposed to the ideal market out of account, is there any warrant for believing that, under the conditions revealed by Mr. Chambers' test of the Gray-King formula for agricultural land values, the demand-supply equation can operate at all?

The Function of the Marginal Producer. The balancing factor in that equation is the marginal producer, the farmer who produces the last bushel of wheat necessary to supply the demand. Theoretically, the price he receives per bushel will exactly equal the cost of production per bushel, leaving him no surplus to capitalize into pure land "value." Theoretically, also, he produces or desists from producing, as he estimates that the price obtainable for his product will or will not repay him for his outlay. In other words, he is supposed to be the instrument through whom price operates in order to bring supply and demand into equilibrium.

Now what happens to that marginal producer when world-wide conditions generate an ever growing demand, when the margin is constantly being pushed out, when the marginal land of this year is supermarginal land next year? Manifestly, the hypothetical marginal producer takes a long look ahead just as Chambers proved the supermarginal producers did. There is this difference, however, between his position with respect to land prices and that of his supermarginal competitor in the market. The latter includes two elements in the

price at which he holds, mortgages, or buys his land—current net land rent capitalized, plus the sum of anticipated future increases in that rent discounted to the present. The former, by definition, has no present surplus over cost of production on which to base even a small fraction of his land price. His entire price, in other words, consists solely of the discounted present "value" of anticipated future increases in rents over the present land rent of zero. When, as frequently happens, he derives a large part of the price he pays for his lands from the proceeds of a mortgage, he robs himself of the freedom of choice which is essential to the performance of his function as a marginal producer. He can no longer desist from producing wheat when the price established by the demand-supply equation falls short of his cost of production. Because all he has been able to save, beg, or borrow is tied up in a submarginal piece of land and the improvements he placed thereon; because his fixed charges go on whether he produces or not; because he still clings blindly to the faith based on past experience that prices of wheat and of wheat land tend ever upward, he continues to produce even at a loss. Because the only factor in the problem which he is free to revise downward is the price he sets on his own labor, he may even try to increase his rate of production by working longer hours, in the vain hope of bringing his costs per bushel down to the sagging price level. In short, in his efforts to escape from the predicament in which he finds himself, the marginal producer, through whom cost of production and price are supposed to come into equilibrium, ceases to discharge his basic function, and throws the entire price mechanism out of gear.

As a result, the supermarginal producer finds himself in difficulty also. The price of his own labor falls to the level established by that of the marginal producer. His land price declines disastrously, not only because the factor I in the Gray-King formula has assumed a negative value, but also because the A in that formula has shrunk.

The Nature of Margins of Production. Let us now turn aside for a moment to examine the nature of the margin of production. At any moment a given piece of land may be below the extensive margin for one type of use but well above that for another. Were this not true, the marginal producer could not exist. He is not a mere abstraction, but a living human being who must earn his bread in the sweat of his brow in one way if not in another. Freedom to produce, or to desist from producing wheat, for example, requires the existence therefore of an alternative outlet for his labor and of an alternative use for the lands he occupies. Of the millions of acres of clearly submarginal lands which were devoted, until the drought struck, to the production at a loss of surplus general farm products, a considerable part might have been profitably employed year after year in the production of beef and hides, mutton and wool, and of mohair, together with the forage crops incidental to those uses, provided the I which inflated not only their prices, but also those of the lands submarginal for the next lower series of uses, had not been capitalized and funded into debts which tended to make the successive series of descending margins rigid rather than flexible. Under such conditions, as the prices of general farm crops rose, the forage crop lands could easily and cheaply have been devoted to the production of cash crops; as prices fell, they could have reverted to their original uses without loss of

labor or capital to the producers.[4] The elasticity thus introduced into the successive margins of cultivation, and into the activities of marginal producers, would have permitted the normal functionings of the demand-supply equation to take care of all variations in supply and demand attributable to weather conditions or to normal growth in demand. Abnormal changes in the relations of demand and supply, such as those engendered by major wars, or possibly by catastrophic droughts, might well have had to be provided against by methods as abnormal economically as the situations which produced them.

Space does not permit an examination of all the types of extensive margins which govern the various successive lower uses of rural lands: the production of lumber; the conservation of wild life with its attendant creation of means of recreation for some, means of livelihood for others; the protection of watersheds; the prevention of erosion by wind and water and of its by-products—the silting up of stream beds and dam sites, and the encroachment of sand on fertile areas. While some of the least productive uses of this type require the direct or indirect intervention of government, they nevertheless provide opportunities for human labor, as well as calculable products out of which the wages of labor can be met.

We have referred heretofore chiefly to the extensive margins of cultivation, but the intensive margin for any product is no less well defined at any moment, no less important from the standpoint of the demand-supply equation, and no less subject to overlaps and shifting. The freedom of choice to shift his land from one use to another as the various margins rise and fall with respect to one another makes for the greater stability of the farmer who practices diversification; the lack of choice open to the specialized farmer lies at the bottom of the economic instability of the producers in regions devoted to single crops. That same lack of choice, incidentally, whether it be caused by the type of farm tenure or by the burden of mortgage debt, plays its part also in disrupting the price mechansim.

A Tentative Hypothesis Concerning Agricultural Prices

The salient features in the hypothesis developed in the preceding paragraphs may be summed up as follows: The economic characteristics of the prices of farm lands differ from those of the prices of farm products in several respects. While they develop originally, and may under certain conditions continue, as controlled by-products of the economically established cost of producing the last units of the commodities necessary to supply the demand, they represent the sum of the capitalized products of two elements, only one of which is subject to immediate economic controls. Under conditions such as those which prevailed from 1897 to 1919, the capitalization of the uncontrolled element may come to represent the full price of land at or below the margin of cultivation, as well as a large part of

[4] The problem of shifting from grazing to agricultural use and back again is not, of course, easy. Nevertheless, select parcels of land which should constitute part of any well organized cattle ranch, and which are devoted year after year to the production of fodder of some type, could be converted to the production of cash crops and back again to raising fodder as the price of wheat rose or fell relative to that of hay. There are not many such parcels of land, but they do exist. The areas susceptible of such management throughout our semi-arid regions are numerous enough to provide great elasticity in our margin of cultivation for general crops. Unfortunately, if a rancher discovers that in years of favorable weather and prices, general farm crops can be produced on such select lands to advantage, he frequently cuts up and sells off as farming land much of his range at prices 10 times or more what it is worth as grazing land.

the prices of lands above that margin. Contracts entered into between buyers and sellers of lands, or between borrowers and lenders on such lands, which involve future payments based on the uncontrolled and unstable land prices of this character, generate conditions under which the otherwise effective economic checks on the production of farm products cease to operate, and the commodity price mechanism is thrown out of gear.

The Hypothesis Subjected to Test

Now what, if any, factual material is available for testing the soundness of this hypothesis? There may be, and I hope there is, a great deal; but little has come within the scope of my limited reading in this specialized field. The Chambers study already cited supports it in large part, but not in its entirety. There are, however, certain valid conclusions, implicit but not yet developed, in the material collected by Mr. Chambers which would probably extend the range within which it substantiates the theory here advanced. Time does not permit an attempt at their development in this article. It is to be hoped that others will undertake that task.

The extent to which submarginal land has been brought and kept under cultivation as the direct result of our method of land pricing is difficult to ascertain. As good an estimate as any perhaps can be deduced from Secretary Wallace's recent pamphlet, *America Must Choose.* In that he states it as his belief that, if the United States decides on a course of extreme nationalism, we must retire "from 40 to 100 million acres of crop land. Forty million, if we take out good land; 100 million if we take out the worst." Under conditions of international trade approximating those which prevailed prior to the World War, he estimates simply that we should have to withdraw from cultivation 25 million acres of our good land. If we apply the ratio of good land to poor land which he used in the earlier estimate, this would seem to indicate that the withdrawal of 60 millions of our worst land would meet the situation. Would it be wholly unwarranted to restate the implications embodied in these estimates submitted by our Secretary of Agriculture as follows: that even under the most favorable conditions he can foresee, he believes that 60 million acres of submarginal land now in cultivation would have to be withdrawn in order to permit the economic mechanism for establishing the prices of farm products to function normally?

How much of this land was improved and brought into production with money borrowed on no better security than a land price based solely on anticipated future increases of rents above a present net land rent of zero, we have no way of knowing. A recent pamphlet, however, dealing with farm mortgage foreclosures in Minnesota throws partial light on this point.[5] The bulletin embodies the conclusions drawn from three separate studies. The first deals with the geographic distribution throughout the state of one large sample of mortgage foreclosures. The finding in this part of the bulletin which has a bearing on our hypothesis is that disproportionately large shares of the total sample concentrate in certain of the newer farming areas.

The second study deals with conditions in paired townships—one pair in each of four counties. In each pair the township with a predominance of

[5] "Farm Mortgage Foreclosures in Minnesota," by E. C. Johnson, University of Minnesota Agricultural Experiment Station, *Bulletin 293*, December, 1932.

"heavy" (that is, productive) soil showed a relatively small percentage of its area sold at foreclosure; the township with "light" (that is, less productive) soil showed a high percentage. In two of the four pairs, average land prices in 1920-1 showed a markedly larger percentage of increase over those of 1912-13 in the townships with poor soils than in those with good soils. In the only pair for which the information is presented, "the claims of creditors against farms sold at sheriff's sales averaged $34 per acre in the township with light soils compared to $37 per acre in the township having heavy soils."[6]

The third study also compares conditions in areas of good soils with those in less productive sections, and discloses that during the boom period (1917-20) sales and resales were more frequent, and at prices relatively higher when productivity was taken into account, in the areas of poor soils than in those of good soils; and that subsequently foreclosures have proven to be "more numerous in the regions where many farms were sold at *speculative* prices."[7]

The italics in the preceding quotation do not appear in the original. They were added to emphasize the fact that in the areas of poor soils—that is to say, in the marginal and submarginal areas—mortgages which deprived the marginal producer of his freedom to produce or not to produce as the market demanded had been based on land prices which could have been derived from the Gray-King formula only by assigning an unduly high value to the anticipated future increases in net land rents.

The hypothesis, in so far as it applies to farm lands, has now been tested against such facts as are readily available. The facts cited, while they do not substantiate the hypothesis in any definitive manner, nevertheless lend color to it. Until further facts can be adduced to the contrary, we are therefore justified in considering the hypothesis tenable.

The Need for Expanding the Hypothesis to Include Other Lands

Can we find any basis for expanding the hypothesis to include other forms of rural lands, as well as urban lands? That the matter is of importance is perhaps sufficiently indicated, in the absence of data on total land "values" either for the farming areas or for the country as a whole, by the fact that of the total assessed valuations of real estate in the 48 states and the District of Columbia, in 1930, 56% was in the 310 cities with a population of 30,000 or over. Were sufficient detail available to eliminate from the remaining 44% the assessed valuations of real estate in urban areas of less than 30,000 population, and of all types of mineral lands, timber lands, and water power, it would become obvious that the assessed valuations of farms represent a relatively minor part of the aggregate taxable real estate in the country as a whole. The reason why this is true, in spite of the relatively large area of farming land, may be illustrated by citing the fact that the taxable valuation of bare land, exclusive of all structures thereon, assigned to single acres in some of our larger cities, is greater than the combined taxable values of lands and buildings together in entire counties devoted exclusively to agriculture. That the taxable values of urban land tend to approximate the land prices with which this article is concerned is clearly proved by the fact that, until 1929, the standard method of testing the accuracy of assessed valuations consisted of com-

[6] *Ibid.*, p. 21.

[7] *Ibid.*, p. 29.

paring those valuations with the prices at which such real estate was sold.

Much Urban Land Not Priced by Classical Formula

How were those prices established? Certainly no one can take a look at the outskirts of any one of our rapidly growing cities without realizing at once that the prices for the square miles of vacant subdivisions were not based on the capitalization of current income. Less obvious, perhaps, but nevertheless as readily demonstrable, is the fact that in many of our blighted urban areas, and in those twilight zones surrounding the established central business areas in our cities, current net land rents would not justify more than a small fraction of the prices at which the lands were held, sold, or mortgaged. While no detailed analyses are available to support the contention, it is therefore reasonable to assume that any valid formula which would fit the facts relative to the system of urban land pricing as it existed prior to 1929 would require the inclusion of some term comparable to that which was designated by $\frac{I}{R^2}$ in the Gray-King formula discussed above.

There is one very important quantitative difference, however, in the ranges within which the aberrations attributable to the use of an uncontrolled I will operate in urban and in farming lands. Exceptional cases have been reported of farm lands in Iowa which were priced at $600 an acre at the height of the boom. The extreme range, then, over a period of time, for the prices of general farming lands in that state, may be taken as extending from zero to $600 per acre. The comparable range for urban lands in one or two of our larger cities is from zero to $600 per square foot, a range more than 40,000 times as great, which was covered within a span of time not much longer than that which it took the Iowa farm to cover its range. The incentive to assign an extravagant value to I is therefore much greater in urban than in rural regions.

If, now, it be conceded that the dominant factor in the pricing of urban lands prior to 1929 was not subject to immediate economic control by any part of the general price mechanism, it is nevertheless pertinent to ask the question, What of it? Manifestly, the existence of an undue number of vacant lots in subdivisions cannot operate to clog the price mechanism for commodities in the same way that the existence of submarginal farms does. Unlike farms, the vacant lots produce nothing beyond weeds and headaches, and both of those products are unsalable at any price. Is it not possible, on the other hand, that the commodity price mechanism can be disrupted by an artificial stimulation of demand, as well as by the persistence of a supply produced at less than cost of production?

Does the System of Urban Land Pricing Affect Commodity Prices?

With this question in mind, let us now examine a typical area of vacant subdivisions more closely. Many of the vacant lots front on paved streets and sidewalks; fire hydrants project above the surface here and there, presumably connected with a network of hidden water mains; sewer manholes and catch basins indicate the existence of a system of underground drains. Apparently, then, these vacant lots, which can produce nothing, did, by some power of alchemy, generate a demand for commodities. What a fascinating doctoral dissertation could be written on the effect of the vacant lot in stimulating a demand for cement, asphalt, and iron and clay products during the period 1921 to 1929!

The appendix, as I visualize it, would present a table showing for each state and the District of Columbia, the total number of vacant lots in subdivisions as at midnight of a given date; the total number equipped with street improvements; the average street frontage of the lots so improved; the number of barrels of cement and of asphalt, and the number of feet of iron, clay, and cement piping required for the street improvements serving that average vacant lot; and finally a grand summary showing for the nation as a whole, by millions in the appropriate units of measurement, the total volume of demand created by these apparently inert and non-productive parcels of unused land. Unfortunately, the dissertation has not been written, so I cannot cite the precise figures. If they were available, I am sure, however, that they would help to explain why both the demand for, and the prices of, certain basic commodities tended to stabilize after the war into what we fondly hoped was a permanent high level of prosperity.

The vacant lot, of course, was neither the sole, nor the chief, culprit in this respect. The overbuilt urban lots of various grades and kinds contributed even more to the distortion of demand. The overlapping of margins for different uses, which has been illustrated above by rural examples, is even more marked in urban lands. Lands well adapted for residential uses may be wholly submarginal for business purposes. Lands well suited for one type of residential or business use may be submarginal for another type of the same use. Certain types of residential uses, on the other hand, may be interchangeable with certain types of business uses. In other words, both the extensive and the intensive margins of utilization in cities cross and recross one another in a most confusing manner.

Urban Land Prices and the Distortion of Demand

And now, keeping this concept of overlapping margins of utilization firmly in mind, let us see what we can find concerning the shifts in urban land prices during the period since 1897. In this part of our inquiry we shall lean heavily on the truly monumental study of land prices in Chicago by Homer Hoyt.[8] No study comparable to this in thoroughness, in comprehensiveness, and in detachment of approach, seems to have been made elsewhere. The assumption that the conditions described by Mr. Hoyt are fairly representative of those which have prevailed throughout many of our American urban centers is warranted by the findings of more specialized studies, such as those made jointly by Simpson and Burton, and by Fisher and Smith,[9] concerning premature subdivisions in a number of our metropolitan areas; it is further supported by the results of personal observation, which can be made by any one with eyes in his head, in all but a few of our cities, great and small. Newly developed sky lines, until recently a source of boastful local pride, and broad fringes of dormant subdivisions formerly buzzing with the activities of developers and salesmen, are commonplaces in our American scene.

The year 1897, which, as we have seen, marked a trough in the general commodity price index, in the index of agricultural prices, and in the prices of

[8] *One Hundred Years of Land Values in Chicago* (Chicago: University of Chicago Press, 1933).

[9] *The Valuation of Vacant Land in Suburban Areas* (Chicago: Institute for Economic Research, 1931); *Land Subdividing and the Rate of Utilization* (Ann Arbor: Michigan Business Studies, 1932), Vol. IV, No. 5; see also Charles D. Clark, "Penalties of Excess Subdividing," 10 *City Planning* 51 (April, 1934).

farm lands, was also a low point in land prices in Chicago. During the periods within which Mr. Chambers' tabulations of farm land prices make a comparison possible, urban land prices in Chicago increased thereafter until 1915 at a rate slightly greater than that of the increase of agricultural land prices per acre in Iowa. Reference to the successive annual assessed valuations of bare lands in New York City after 1904 shows that land prices in that city also showed a steady upward trend during the same period, but at a rate somewhat less than that of farm land prices.

As a result of rapidly mounting taxes, costs of operation and costs of building, land prices both in Chicago and in New York City showed a decided tendency to sag for some years after 1915. At the same time, the rapid increase in the prices of farm products during the war started farm land prices on a dizzy ascent which came to an end in 1920. After the bottom had literally fallen out of the prices both of agricultural products and of farm land prices, aggregate land prices both in Chicago and in New York started a rapid rise—a rise which continued until the general commodity price index began to recede from the high level established during the Coolidge era of urban prosperity.

Inflated Land Prices in Chicago. And now let us refer to the enlightening series of tables and charts which Mr. Hoyt has used to illustrate the progress of land prices in local areas within the limits of Chicago. Both in the central and in the outlying business areas of that city, already intensively used for the purposes to which they were best adapted, land prices increased markedly after 1922. Obviously, buyers and sellers, borrowers and lenders, had agreed that the intensive margin of utilization in the business districts was in process of moving upward; that they were justified in imputing to the lands within those areas a price computed not only on the basis of the net annual land rents produced by the existing intensity of use, but by the capitalization also of an *I* based on an anticipated increase in the intensity of use. At the same time, the prices of lands contiguous to the central or outlying business areas began to increase rapidly. In this case the prices were predicated on an anticipated shift in type of utilization—on the assumption that the extensive margin of business uses was being pushed outward from the center. The capitalization of current net land rents played a minor part in the estimate of land prices in those areas, because the existing rents were derived from uses which were to be abandoned. In such areas, as in the case of submarginal farming lands, land prices are notably unstable and short-lived, because they consist so largely, in so far as the new uses are concerned, of the discounted sums of anticipated future increases in land rents over a present rent of zero.

The Building Boom. Hand in hand with the sharp increases in land prices in certain areas of the city, a building boom got under way. Did these two separate and distinct series of economic facts merely happen to coincide in point of time, or was there some causal relationship between them? If there was such a relationship, what was its nature; which was cause and which was effect?

In order to find a basis for a reasoned answer, let us turn aside for a moment to examine the rules and methods which had grown up in the art of appraising urban real estate before the post war boom got under way. In R. M. Hurd's pioneer work in the field, *Principles of City Land Values* first published in 1903, and in the majority of its small number

of successors until well after the World War, tables were presented showing what were deemed to be optimum ratios between the "values" of lands suitable for given uses and the amounts which should be expended on them in buildings in order to obtain maximum returns on the aggregate investments in lands and buildings. The accepted ratios were 1 to 1 for business uses; 1 of land "values" to 5 of building costs for residential uses. In short, these works reduced to crude rules of thumb the theory of the intensive margin of land utilization which had made its appearance in the economic literature dealing with agriculture in Sir Arthur West's *Essay on the Application of Capital to Land*, first published in 1815.

In more recent books on appraisal the same concept appears in the theory of the highest and best use. In that form it provided the basis at the peak of the boom for numerous studies of optimum heights for skyscrapers or for multi-family dwellings suitable for given pieces of land. Many of them were made with meticulous regard for elevator space, or the increasing cost per cubic foot of contents as the height of the building increased; but frequently with an almost fatuous reliance on the assumption that existing figures on percentage of occupancy, and on rentals per square foot within the district, would remain unaffected by the large increases in the volume of rentable space to be added by the building in question or by other buildings.

Whether in the crude form of the earlier writers on appraisal practice, or in the more refined and guarded form in which the later writers stated their theories, the rules and theories started with an assumed price or "value" for a given piece of land; they made that the independent variable in the problem and made building costs the dependent variable. If the land price was only high enough, the sky became the limit either for building height or for building cost. If the appraiser for a building loan was in error in determining the "value" of the land, his error was multiplied by two if the land was deemed suitable for central business uses; if, on the other hand, the land was deemed suitable for residential uses, any error in land appraisal might be multiplied by six or more. To make matters worse, the writers both of the earlier and of the later periods recognized the fact that a property, once improved, should earn a return on combined land and building costs not during one year but during a long series of years. Therefore, they said, when land prices are advancing—as they had been since 1897—the ratios between land and building costs should be adjusted not on the basis of present land prices, but on that of some price which the land might be assumed to reach at some future time during the useful life of the building.

With such theories firmly embedded both in the theory and practice of real estate appraisal, is it any wonder that the increases in land prices should have precipitated a building boom? Nay, those increases did more than that. They provided an apparently inexhaustible reservoir of credit out of which the new construction could be safely and easily financed. Cautiously at first, and then with more assurance, the conservative lending agencies began, about 1922, to lend on building mortgages. To operate in fields which these agencies were afraid to enter, or were debarred by statute from entering, new banks were created; new types of lending agencies, such as the mortgage participation companies, were invented. As the boom grew, and

optimism increased, "contractors . . . in Chicago sometimes made an agreement to purchase a lot, put up a small deposit on the purchase price, drew plans for an elaborate structure, and on this basis secured a loan large enough to pay the balance due on the lot and to complete the building. Again several large Loop office buildings . . . were erected by parties who secured a ground lease and who virtually without any capital succeeded in securing a loan on a bond issue sufficient to erect a skyscraper."[10]

The new buildings erected during the seven-year building boom "required 3,060,111 front feet, or 580 miles of street frontage."[11] This had the effect of stimulating a demand for vacant building sites, which in turn created a new reservoir of public and private credit for street improvements as well as for the erection of buildings. All of which, together with other equally pertinent material, is fully described and amply documented in Mr. Hoyt's admirable contribution to basic economics.

The Effect on Commodity Prices. And now, what is the bearing of these facts on our hypothesis? The following interpretation seems to me to be reasonable: that there was a definite causal relationship between the boom in urban land prices and the building boom; that the capitalization of *I* provided the funds out of which the new buildings were financed; that the building boom itself set in motion a whole new set of forces. The sudden increase in the demand for building materials of all types first appeared in the "backlogs of unfilled orders" on the books of the steel companies, the cement companies, the clay product companies, the lumber companies. It was reflected in the high level of prices at which those commodities stabilized, in the growing dividends declared by the companies, in the mounting prices of the shares of stocks listed on the large exchanges, in the volume of new issues for plant enlargements and and for new plants. It made itself felt in the prices of raw materials, and consequently in the prices of mineral lands and of timber stumpage. When the output became heavy enough to tax the capacity of existing transportation systems, it began to have corresponding effects on the prices of railway stocks and on the volume of new issues for rolling stock, for double tracking, for expanded terminals. When the flood of building materials reached the cities, it set up a demand for artisans in the highly unionized building crafts, as well as for common labor, and laid the foundation all along the line, from forest and mine to construction job, for the high wages which, outside the farming areas, were characteristic of the boom period.

Repercussions of Urban Demand on the Farm Situation. Because, as we have already seen, wages on the farm were depressed after 1920, the young men in the farming areas and others who were not anchored by mortgages, flocked to the forests, the mines, the heavy industries, and construction, where money wages were relatively higher. This factor in turn intensified the already bloated demand for urban housing, and for sites on which to erect houses. The essential tools and materials which farmers were compelled to buy for operations and maintenance were all made of basic commodities, the price of which had been forced up by the urban demand; they were fabricated by labor the wages of which had been forced up similarly. The short-term labor necessary

[10] Hoyt, *op. cit.*, p. 386.

[11] *Ibid.*, p. 387.

in the harvests also increased in price. As a result, the farmer's cost of operation was forced up throughout the entire area of cultivation, from margin to center of production; the sum of his own wages plus his net land rent, if he had any left, provided the only income from which he could meet the increased costs. If he had no such income, he had to borrow to pay his cost of production. That he did so is perhaps sufficiently indicated by the fact that the average mortgage debt per acre of farms operated by owners showed progressive increases above the level of 1920 in 1926, 1928, and 1930.[12]

Summary

By tracing single threads through the complicated web of the economic fabric, we have now evolved the bare outline of a hypothesis concerning the place of land prices in a commodity price system. We have seen that the existence of contractual obligations to pay over a long term of years, based on the capitalization of a non-existent *I* not subject to immediate control by any part of the commodity price system, generates conditions under which the price of farm products can no longer bring the supply into equilibrium with demand. We have not taken time to show how during the ascending portion of the cycle of prices for farm commodities, expenditures for farm improvements, highways, schools, etc., in the farm area, which are financed out of loans based on the capitalization of *I*, distort temporarily the demand for other than farm commodities. We have next seen how an even more aberrant *I* in urban areas generates an abnormal demand for durable goods which in turn disrupts the entire mechanism for the control of supply and demand in that field. In effect, the urban *I* generates the forces through which it is possible to telescope into a short period an aggregate demand for durable goods sufficient to meet the needs of a long period—a demand sufficient to meet effective current needs, plus deferred needs which will become effective only after the lapse of one or more years, plus hypothetical future needs some of which will never be realized.

When this telescoped demand impinges on a market adjusted simply to meet a normal annual demand, strains are generated on the demand-supply equation which give us for a time a high degree of prosperity. As the inexorable march of time carries us on into the years for which we have already supplied in advance the normal demand for goods of that nature, prosperity is replaced by depression. Then, in turn, the urban industrial plants, newly equipped to meet an abnormally high annual demand by the lavish expenditure of borrowed money, enter a stage which we have traced in detail only for the farms —a stage in which producers continue to produce even at a loss in order to meet at least a part of their fixed charges. As in the case of the farmers, their contractual obligations deprive them of the freedom to desist from producing. The owners of the premature buildings find themselves with a surplus of rentable space, which they in turn also offer at a loss.

Conclusions

Using the figures embodied in several studies, we have now endeavored to trace the disruptive effects of land prices on commodity prices throughout that part of the major commodity price cycle which began in 1897. Needless to say, the body of material available for testing the hypothesis during earlier

[12] "Farm Mortgages: A Pressing National Problem," by Eric Englund, *New York Times*, February 5, 1933.

periods is slender indeed; but let us see what resources may be available which would serve us in ascertaining whether anything comparable had happened prior to 1897.

In the first place, we have the study by Mr. Hoyt which has already been cited. So far as Chicago is concerned, the figures there presented showing the violent oscillations in land prices from period to period throughout the past 100 years, together with the successive booms and depressions in building, in subdivision, and in public improvement do not, so far as I can see, do violence to our theory at any point.

For the nation as a whole, the available information is less detailed. Furthermore, in certain of its aspects, the evidence is qualitative rather than quantitative; in other respects, it is indirect rather than direct. Corroborative material can be gleaned however, by an understanding reading of A. M. Sakolski's *The Great American Land Bubble*,[13] in conjunction with Henry C. Adams' *Public Debts*[14] and A. M. Hillhouse's dissertation on municipal defaults.[15] When these volumes are perused against the background provided by any good chart of the commodity price index, they point strongly to the conclusion that in 1837 and in 1873, as in 1929, the nation had paved the way for an inevitable economic collapse by capitalizing in advance the anticipated increases in net land rents—increases all too frequently over a current rent of zero. The immediate results in each case were feverish activities in construction, the stabilization of commodity prices at an artificially high level, and a widespread prosperity; the end results proved invariably to be unemployment, bread lines, individual and corporate bankruptcies, and governmental defaults.

If the hypothesis here advanced should stand the test of independent verification, it would at once lead us to a basic question: What, if anything, can be done about it? It may be that the demand-supply equation itself gives us a clue to the answer. Current land rent, as we have seen, is a controlled by-product of the cost of producing the last unit of a commodity necessary to bring supply and demand into equilibrium. That element in land prices is therefore subject to almost automatic and immediate economic controls by the commodity price mechanism itself. If that be granted, the question resolves itself into this: How can the uncontrolled and disruptive element *I* in land prices be eliminated from the land-pricing formula? That would seem to be one of the major problems which confronts not only land economists but economists in general.

[13] New York: Harper & Brothers, 1932.
[14] New York: D. Appleton Co., 1887.
[15] For a condensed statement of Mr. Hillhouse's findings see "Municipal Debt Defaults," Public Administration Service, *Bulletin No. 33*, Chapter IV (1933).

"Ready-Made" Residential Electric Consumer Analyses

By JAMES J. HANKS*

WHEN revisions of utility rates are under consideration, analyses of the consumptions of customers being served on such rates are essential. Such analyses are generally referred to as consumer analyses. The purpose of the consumer analysis is to make available a means for determining the effect of a proposed rate change on revenues of a company.

In order to determine this effect, attempts were first made to apply the new rate to each monthly bill of each customer affected by the change in rate. To compute 12 monthly bills under proposed rates for each customer receiving service was an almost impossible task for any large utility. It soon became apparent that consumer bills having the same number of kilowatt hours could be segregated into groups and that the kilowatt hours in these groups could be classified into consumption "blocks", thus making available a means for determining the effect of proposed rates on revenues. The particular "blocks" chosen for any analysis depended on the blocks in the existing rate and the probable "blocks" in any proposed rate.

Even this method of analysis involved a tremendous amount of work when a classification of the 12 monthly bills of all customers was attempted. In order to simplify the work, consumer analyses were made of only six, four, two, or one month's consumption, or of a sample group of customers selected as representative. The data obtained from these studies were then arbitrarily expanded to a 12-months' and /or a total-customer basis in order to estimate annual revenues based on the proposed rate. All these methods of analysis involve considerable expense. A 12-months' analysis of 50,000 residential customers means taking from the company's consumer ledgers 600,000 items which have to be classified and analyzed. Although considerably less expense is involved in making limited studies of consumer data, such incomplete analyses may prove to be very costly to a utility when inaccurate information is used as a basis for rate revisions.

In addition to the element of expense, consumer analyses have the tendency of rapidly becoming obsolete because of changing conditions in the use of utility service. Consumer analyses made in one year seldom retain sufficient accuracy to be used in the second or third years unless they are carefully revised on the basis of additional information. During the past few years, especially, numerous revisions of rates have brought the problem of the expense of consumer analyses into bold relief.

Thus, particularly at this time, there is a real need for methods of consumer analyses which will eliminate much of the time and labor involved in making the more comprehensive types of analysis and which, at the same time, will give information possessing not only a high degree of accuracy but information adaptable to changing conditions. The following excerpts from an editorial in a recent number of *Electrical World*

* The author wishes to acknowledge the helpful assistance and suggestions of Hanina Zinder, Barclay J. Sickler, R. E. Purucker, and other members of the staff of the Rates and Research Division and Engineering Department of the Public Service Commission of Wisconsin.

summarize these points of view:

"The making of customer-bill analyses to discern the effect of some new rate is a fairly expensive matter even when short cuts are taken. . . . There is precious little literature on the technique of rate analyses. There is a call for more of it."[1]

Within recent months several papers and articles have been written on this general subject.[2] These writings are concerned primarily with the technique and form for making the analyses.

Tendencies Noted in Residential Consumer Analyses

Because of the large number of residential customers, the analysis of residential service is generally the most time-consuming and expensive of all consumer analyses. During recent years the Rates and Research Division of the Public Service Commission of Wisconsin has made a large number of these analyses. In the routine of making the analyses, certain tendencies were observed which seemed to point the way to a method of obtaining the necessary data with considerably less time and expense. It was noted that communities with small average consumptions per bill seemed to have a greater percentage of their total consumption in the lower kilowatt-hour blocks than did communities with a higher average consumption per bill. To check further these observations, the kilowatt-hour consumption figures of each of 50 residential consumer analyses, representing 70 communities ranging in size from 100 to 575,000 in population, were brought together for study. These analyses were classified into blocks of 10 kw. hrs. from zero to 100 kw. hrs., blocks of 25 kw. hrs. from 100 to 150 kw. hrs., and a single block for consumptions in excess of 150 kw. hrs. To facilitate comparison of the various analyses, the kilowatt hours in each block were expressed in terms of percentage of the total kilowatt hours appearing in all blocks.

The word "block" as it is here used warrants definition. In Table I the number of bills and kilowatt hours consumed in each consumption "step" are listed in Columns B and C. In the range between 26 and 50 kw. hrs. there were 124 bills, the total consumption in this "step" being 4,201 kw. hrs. The rate for this community is 8c net for the first 25 kw. hrs. consumed per month, 6c for the next 25 kw. hrs., and all over 50 kw. hrs. at 4c. Thus, a part of the 4,201 kw. hrs. in the "step" of 26 to 50 will be billed at 8c and a part at 6c. The consumption which will be billed at 8c is 3,100 kw. hrs., for this is the consumption which falls within the first "block" of zero to 25 kw. hrs. Thus, Column C shows the number of kilowatt hours in each "step", while the totals of Columns D through I show the number of kilowatt hours falling into each "block." The breakdown of the consumption figures into blocks is the goal of any consumer analysis, since these are the data necessary to determine the revenues under any given rate.

TABLE I. METHOD ILLUSTRATING THE DISTRIBUTION OF KILOWATT HOURS FROM "STEPS" INTO "BLOCKS"

Steps	Bills	Kw. hrs	Kilowatt-hour Distribution into Blocks					
			0–25	26–50	51–75	76–100	101–150	Over 150
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
0–25	426	5,696	5,696					
26–50	124	4,201	3,100	1,101				
51–75	26	1,592	650	650	292			
76–100	5	424	125	125	125	49		
101–150	7	817	175	175	175	175	117	
Over 150	9	1,681	175	175	175	175	350	631
Total	597	14,411	9,921	2,226	767	399	467	631

[1] 113 *Electrical World* 497-498 (April 7, 1934).

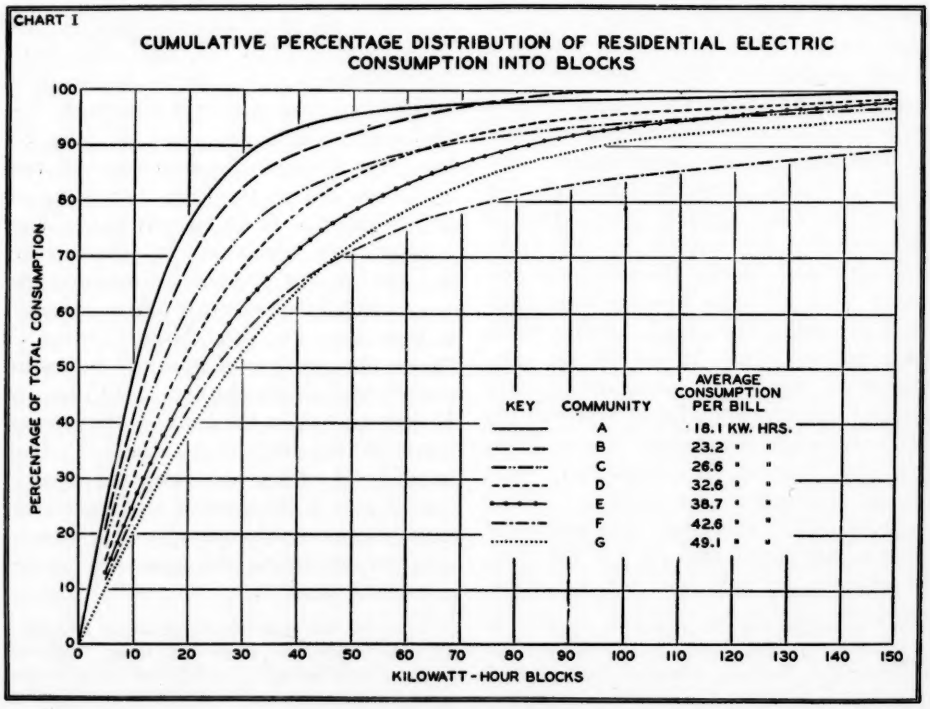
[2] *Consumer and Consumption Data—Residential Customers* by R. E. Purucker, Electrical Engineer, Engineering Staff, Wisconsin Public Service Commission. Prepared for the 12th Annual Conference of Utility Commission Engineers; Hugh M. Leaming, "How We Evaluate Rate Changes," 103 *Electrical World* 899-900 (June 23, 1934).

On Chart I is presented graphically the distribution into kilowatt-hour blocks of several of the 50 analyses studied and referred to above. The use of the chart may briefly be described as follows: Community A has an average consumption of 18.1 kw. hrs. per bill. Reading the curve at 20 kw. hrs. shows that 75.7% of the total consumption falls within the block of zero to 20 kw. hrs. At 40 kw. hrs. the curve indicates that 93.2% of the total consumption falls within the block of zero to 40 kw. hrs. The difference between these two percentages, or 17.5%, represents the percentage of total kilowatt hours in the block of 20 to 40 kw. hrs.

Inspection of Chart I indicates that Community A, with a low average consumption per bill, has 87.9% of its total consumption in the first block of 30 kw. hrs., whereas Community G, with a relatively high average consumption per bill, has but 52.6% of its total consumption in this block. The communities between A and G arranged according to the average consumptions per bill corroborate the above and earlier observations—namely, communities with low average consumptions per bill have a greater percentage of their total consumption within the lower blocks than do communities with higher average consumptions per bill. The term "lower blocks" as used here refers to those blocks which, regardless of size, generally fall between zero and 50 kw. hrs. per month, whereas "higher blocks" refer to those blocks which, also regardless of size, generally fall in the area exceeding 50 kw. hrs. per month.

From the above observations one might be led to believe that communities which had a greater proportion of

CHART I



their consumption in the lower blocks would have a correspondingly smaller proportion of their consumption in the higher blocks. Such, however, was not always found to be the case.

Referring again to Chart I we find that Community G, with a higher average consumption per bill than Community F, has only 9.3% of its total consumption in the block over 100 kw. hrs., whereas the latter community has 15.9% of its total consumption in that block. This is explained by the fact that Community F has a large number of seasonal cottage and heating and cooking customers taking service on the residential rate at the higher steps, whereas Community G has a relatively smaller number of such customers. The consumptions of the seasonal cottage and heating and cooking customers in Community F were not sufficiently large to raise the average consumption per bill of that community over the average consumption of Community G. The consumptions were, however, sufficiently large to give Community F a high percentage of consumption in the higher blocks.

Other examples of irregularity among the curves in the higher blocks are very much in evidence. These irregularities exist because some communities have a relatively large amount of consumption in the higher blocks while the consumption of other communities in these blocks is very low. There seems to be no correlation between the amount of consumption in the higher blocks and the average consumption per bill. However, the effect of the amount of consumption in the higher blocks has a marked effect on the distribution curves.

It appeared that an orderly sequence of curves dependent upon the average use per bill was destroyed by the number of unusually large users and their total consumption which existed in any given case. At the present time only the very exceptional community has a large number of customers using more than 100 kw. hrs. per month. If the irregularities found could be eliminated by excluding these large users, then perhaps some orderly relationship in the distribution of the remaining kilowatt hours could be discovered. The distribution of the total kilowatt hours in bills in excess of 100 kw. hrs. could then be made separately at small expense because of the small number of bills involved.

Development of the "Ready-Made" Consumer Analysis

The next step taken was to revise the consumer analyses by eliminating all bills of more than 100 kw. hrs. For this study only those analyses were included which had consumptions ranging from zero through 100 kw. hrs. A few of the smaller communities failed to have monthly consumptions which reached 100 kw. hrs. Since the number of bills in these communities was very small, it was felt that a normal distribution of consumptions was not obtained.

After the elimination of all bills in excess of 100 kw. hrs., the consumption of bills of 100 kw. hrs. or less was broken down into blocks, and the kilowatt hours in each block were expressed in terms of the percentage to the total kilowatt hours. The analyses were then classified on the basis of the average consumption per bill (*bills over 100 kw. hrs. eliminated*)—i.e., all analyses which had an average consumption per bill ranging from 20 to 23 kw. hrs. were placed in one classification, those from 23 to 26 kw. hrs. in another, etc. Finally, an average kilowatt-hour distribution into blocks was worked out for each group. These average distributions are presented in Table II and on Chart II.

Turning to Chart II we find that the elimination of bills over 100 kw. hrs. has resulted in a series of curves which obviously have a regular relationship to the average consumption. From Group I through to Group VIII the curves progressively approach the limit shown by the dotted line. This line represents the distribution in the case of an average of 100 kw. hrs. per bill for all bills of 100 kw. hrs.

Inspection of Table II shows that Group I, with an average consumption of 17.3 kw. hrs. per bill for bills of 100 kw. hrs. or less, has 78.6% of its consumption in the first block of 20 and but 1% (100% minus 99% shown at 60 kw. hrs.) in the block from 60 to 100, whereas Group VIII, with an average consumption of 39.6 kw. hrs. per bill, has but 47.2% of its consumption in the first block of 20 and 6.9% in the block from 60 to 100. Throughout the series of curves there is a direct relationship between the average consumption and the distribution of the consumptions into the various blocks.

It may be argued that mathematically there is more than one combination of numbers from 1 to 100 which total to a given quantity, even when taken in units of tens, that will give a particular average. However, when the number of bills involved is large and when by choice the range is restricted to an area where there are likely to be some bills in each unit, the law of probability seems to give distributions to each average which lie close enough together to be represented by one curve without any appreciable error. On the other hand, perhaps the explanation is not to be found in the laws of numbers but rather in the economics of the value-of-service. Each community is likely to have a certain number of small, average, and large users of service. The average use per bill then is simply an index number which shifts the percentage of each type of user up or down. No attempt has been made to determine specifically the cause for the uniformity found, if there be any one cause. It is enough for present purposes to know the answer and to know that the answer is sufficiently accurate and correct to be used without hesitation within the limits

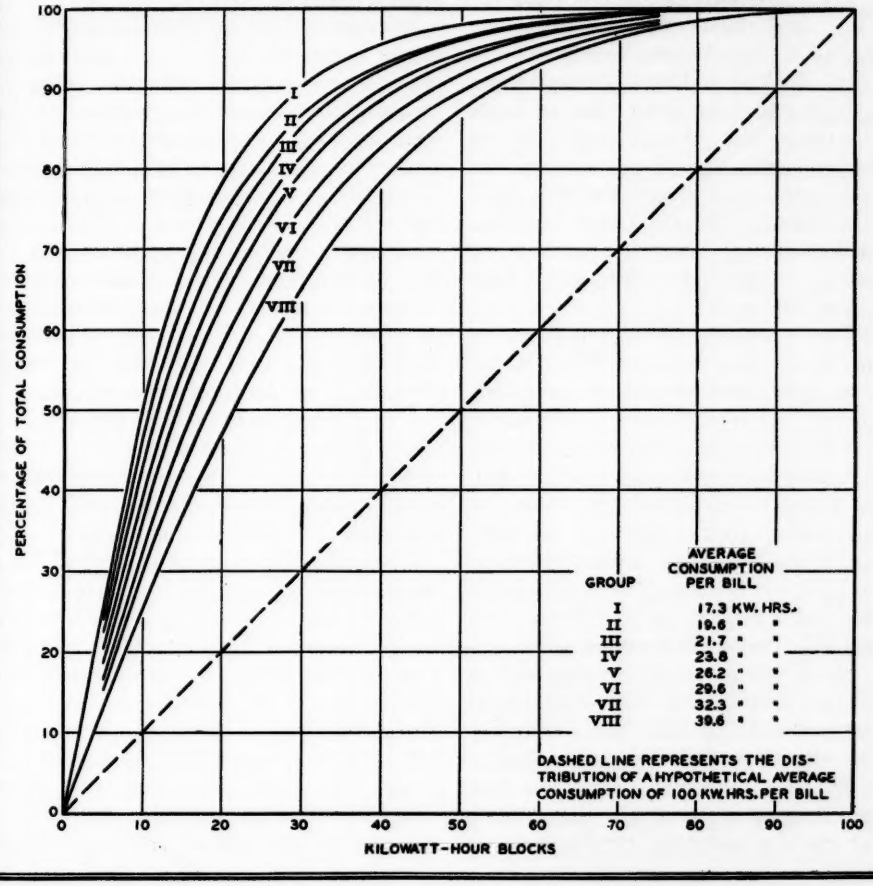
TABLE II. CUMULATIVE PERCENTAGE DISTRIBUTION INTO BLOCKS OF CONSUMPTION IN RESIDENTIAL ELECTRIC BILLS OF 100 KW. HRS. AND LESS
(Classified into Groups on Basis of the Average Consumption per Bill)

Blocks	GROUPS							
	I	II	III	IV	V	VI	VII	VIII
0	0%	0%	0%	0%	0%	0%	0%	0%
10	51.4	47.0	43.3	39.6	36.5	32.6	30.0	25.2
20	78.6	74.2	70.9	66.6	63.6	58.4	54.6	47.2
30	90.4	86.9	85.4	81.9	79.8	75.5	71.8	65.4
40	95.7	93.1	92.6	90.1	88.8	85.8	82.9	78.6
50	98.0	96.5	96.2	94.6	93.9	91.9	89.9	87.5
60	99.0	98.4	98.1	97.0	96.8	95.6	94.4	93.1
70	99.6	99.1	99.1	98.5	98.5	97.8	97.1	96.5
80	99.8	99.7	99.7	99.4	99.4	99.1	98.9	98.7
90	99.9	99.9	99.9	99.8	99.8	99.8	99.8	99.8
100	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Average Consumption per Bill.....	17.3 kw.hrs	19.6 kw.hrs	21.7 kw.hrs	23.8 kw.hrs	26.2 kw.hrs	29.6 kw.hrs	32.3 kw.hrs	39.6 kw.hrs
Number of Consumer Analyses in Group.....	2	2	6	9	4	8	6	3

CHART II

CUMULATIVE PERCENTAGE DISTRIBUTION INTO BLOCKS OF CONSUMPTION IN RESIDENTIAL ELECTRIC BILLS OF 100 KILOWATT HOURS AND LESS CLASSIFIED INTO GROUPS ON BASIS OF THE AVERAGE CONSUMPTION PER BILL

FIGURES ON WHICH CURVES ARE BASED APPEAR IN TABLE II



prescribed.

Having set up the curves on Chart II, we now have a fairly accurate picture of the distribution into blocks of the consumption of a given community or group of communities, depending on the average consumption per bill of bills of 100 kw. hrs. or less. Since considerable interpolation would be required to calculate the kilowatt-hour distribution of communities whose consumptions per bill did not exactly correspond with the average consumption per bill of one of the curves on the chart, the next step was to set up curves for as many average consumptions as possible.

Inspection of Table II shows that the average consumption per bill for Group V is 26.2 kw. hrs., while the corresponding figure for Group VI is 29.6 kw. hrs. There is thus a zone of 3.4 kw. hrs. between these two series for which no

curves have been established. Within the first block of 30 kw. hrs. Group V has 79.8% of its consumption, while Group VI has but 75.5% of its consumption. This difference of 4.3% divided by 3.4 kw. hrs. shows that between the curves of Group V and Group VI for the first block of 30 there is a variation of 1.3% for each kilowatt hour of average consumption. At the first block of 40 kw. hrs. this variation was found to be 1.0% per unit, and at 50 kw. hrs., .6%. In like manner the variations between the other groups at each consumption block were worked out. With the variations per kilowatt hour of average consumption worked out at each block of 10 for each zone between the various groups, it became possible to establish a series of kilowatt-hour distribution curves for each unit of average consumption per bill between 17 and 40 kw. hrs.

As might be expected, the series of unit variation figures between the various groups and blocks showed some signs of irregularity. This may be attributable to the fact that three of the groups contained only two or three consumer analyses, which could hardly be expected to result in a distribution curve that would be representative for all consumer analyses having the same average consumption per bill. However, it was felt that these irregularities would have little effect on the accuracy of the average kilowatt-hour distribution series, and less effect on the final revenue figures which would be obtained. The reasonableness of this position will appear later.

In order to eliminate the irregularities in the series of variations, a smoothing process was applied. We felt justified in using this smoothing process, for, in spite of the irregularities referred to above, there seemed to be a high degree of regularity among a large majority of the variations in the series. Then, too, by using a smoothing process, weight was being given to the entire series of consumer analyses. It is significant that in no instance did the smoothing process alter a single unit variation by more than 0.2% of the total consumption.

Using the kilowatt-hour distribution series of Group VI as a base (Group VI was used because it represented those communities whose average bills were approximately half way between 17 and 40 kw. hrs.), a series of smoothed unit variations was applied to establish the series of kilowatt-hour distributions for each kilowatt hour of average consumption for bills of 100 kw. hrs. or less within the range of 17 through 40 kw. hrs. These distribution series appear in Table III, and are presented graphically on Chart III. Since the presentation of all series on the chart would have made it difficult to distinguish one curve from

TABLE III. "READY-MADE" RESIDENTIAL ELECTRIC CONSUMER ANALYSIS DATA

(Cumulative Percentage Distribution in Blocks, Classified by Average Consumption)

Blocks	Average Kilowatt Hours per Bill for All Bills of 100 Kw. Hrs. and Less																							
	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	
0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
10	52.0	50.0	48.0	46.1	44.3	42.6	41.0	39.5	38.1	36.8	35.5	34.3	33.2	32.2	31.3	30.4	29.6	28.8	28.1	27.4	26.7	26.1	25.5	
20	79.2	77.3	75.4	73.6	71.8	70.1	68.4	66.8	65.2	63.6	62.1	60.6	59.2	57.8	56.5	55.2	54.0	52.8	51.7	50.6	49.6	48.6	47.7	
30	90.8	89.7	88.6	87.5	86.3	85.1	83.9	82.6	81.3	80.0	78.7	77.4	76.2	75.0	73.8	72.7	71.6	70.5	69.5	68.5	67.5	66.6	65.8	
40	96.0	95.4	94.8	94.1	93.4	92.6	91.8	90.9	90.0	89.1	88.2	87.3	86.4	85.5	84.7	83.9	83.1	82.3	81.6	80.9	80.2	79.6	79.0	
50	98.2	97.8	97.4	97.0	96.6	96.1	95.6	95.1	94.5	93.9	93.3	92.7	92.2	91.7	91.2	90.7	90.2	89.7	89.3	88.9	88.5	88.1	87.7	
60	99.1	98.9	98.7	98.5	98.3	98.1	97.8	97.5	97.2	96.9	96.6	96.2	95.8	95.5	95.2	94.9	94.6	94.3	94.0	93.8	93.6	93.4	93.2	
70	99.7	99.6	99.5	99.4	99.3	99.2	99.1	98.9	98.7	98.5	98.3	98.1	97.9	97.7	97.5	97.3	97.2	97.1	97.0	96.9	96.8	96.7	96.6	
80	99.8	99.8	99.7	99.7	99.6	99.6	99.5	99.5	99.4	99.4	99.3	99.2	99.1	99.1	99.0	99.0	98.9	98.9	98.8	98.8	98.7	98.7	98.7	
90	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	
100	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	

another, only the series of the even number average consumptions are presented.

Table III and Chart III therefore afford the working basis for distributing into blocks, without the aid of a consumer analysis, the consumptions of residential customers whose bills are 100 kw. hrs. or less. However, separate analyses will have to be made of customers whose bills exceed 100 kw. hrs. Furthermore, the number of minimum bills and the kilowatt hours consumed in such bills will have to be calculated in order that fairly accurate revenue figures may be determined later in the study. The task of analyzing the consumptions of these two classes of customers should not be very large, for the percentage of such customers to the total number of customers is generally quite small.

Use of "Ready-Made" Analysis

In order to demonstrate the use of the

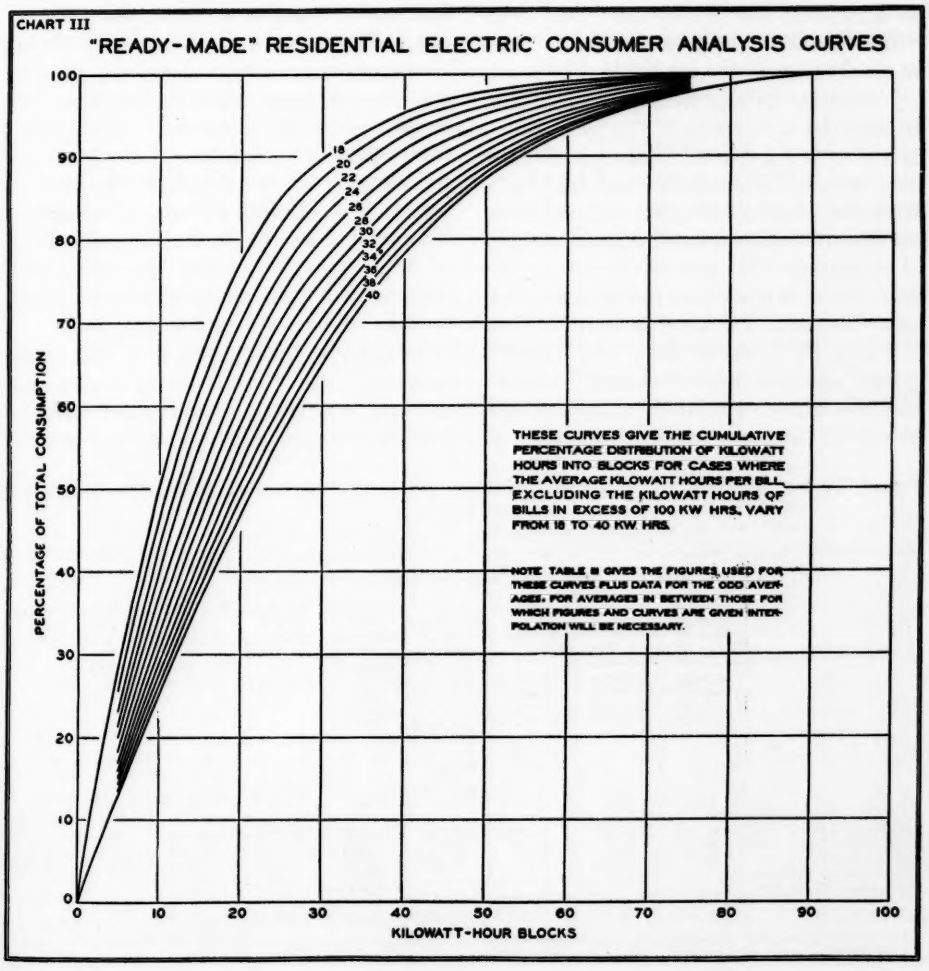


TABLE IV-a. DATA REQUIRED AS BASIS FOR "READY-MADE" RESIDENTIAL ELECTRIC CONSUMER ANALYSIS FOR COMMUNITY X

Total Number of Residential Bills	11,732
Less Number of Bills in Step over 100 Kw. Hrs.	615
Equals Number of Bills in Step of 1st 100 Kw. Hrs.	11,117
Number of Minimum Bills	2,188
Total Kilowatt-hour Residential Consumption	427,227
Less Consumption of Bills in Step over 100 Kw. Hrs.	110,528
Equals Consumption of Bills in Step of 1st 100 Kw. Hrs.	316,699
Consumption in Minimum Bills	17,938
Analysis of Consumption in Bills over 100 Kw. Hrs.*	
First Block of 20 Kw.Hrs. (615 Bills x 20 Kw.Hrs.)	12,300
Next Block of 20 Kw.Hrs. (615 Bills x 20 Kw.Hrs.)	12,300
Next Block of 60 Kw.Hrs. (615 Bills x 60 Kw.Hrs.)	36,900
Next Block of 50 Kw.Hrs. (By detailed analysis)	22,211
Block over 150 Kw.Hrs. (By detailed analysis)	26,817
Total Revenues	$27,302

* Analysis of 615 bills or 5.2% of total bills.

new method, the complete process will be described for Community X. The information required as a basis for such an analysis appears in Table IV-a.

Inspection of this table will show that an analysis was made of the 615 bills in excess of 100 kw. hrs. This analysis was very simple, for the bills which had to be analyzed were only 5.2% of the total number of bills. Likewise, the analysis of minimum bills was easily made, for only the number of such bills and their total consumption were required.

Table IV-b shows how the "ready-made" analysis method is used to calculate the kilowatt-hour distribution into blocks of the total residential consumption of Community X. In Table IV-a it will be noted that the consumption in bills of 100 kw. hrs. or less is 316,699 kw. hrs. and that 11,117 bills appear in this class, resulting in an average consumption of 28.5 kw. hrs. per bill. In Columns A and B of Table IV-b appear the percentage distribution figures for bills of 100 kw. hrs. or less, obtained from Table III, of communities with average consumptions of 28 kw. hrs. and 29 kw. hrs. respectively. In Column C appear the percentage distribution figures, interpolated from the preceding columns, of a community with an average consumption, for bills of 100 kw. hrs. or less, of 28.5 kw. hrs. In Column D these percentage figures have been applied to the total kilowatt-hour consumption figure for bills of 100 kw. hrs. or less. Column E gives the distribution into blocks of the consumptions of bills in excess of 100 kw. hrs., and Column F shows the total consumption in each block for Community X.

In order to have a check on the accuracy of the "ready-made" analysis method, a detailed residential consumer analysis of all bills for a 12-months'

TABLE IV-b. KILOWATT-HOUR DISTRIBUTION OF TOTAL RESIDENTIAL CONSUMPTION IN COMMUNITY X

(Based on "Ready-Made" and Actual Consumer Analyses)

	KILOWATT-HOUR DISTRIBUTION BASED ON "READY-MADE" ANALYSIS						Kilowatt-Hour Distribution Based on Actual Consumer Analysis	Actual Difference between the Two Methods of Analysis	Percentage Difference
	Percentage Kilowatt-Hour Distribution of Consumption in Bills of 100 kw. hrs. or less Based on Table III			Actual Distribution of Consumption in Bills of 100 kw. hrs. or less for community (Averaging 28.5 kw. hrs. per Bill)	Distribution of Consumption of Bills in excess of 100 kw. hrs. in Community.	Distribution of Total Consumption in Community.			
	Average Consumption per Bill of 28 kw. hrs.	Average Consumption per Bill of 29 kw. hrs.	Average Consumption per Bill of 28.5 kw. hrs. (Interpolated)						
	(A)	(B)	(C)	(Kw. hrs.) (D)	(Kw. hrs.)* (E)	(Kw. hrs.) (F)	(Kw. hrs.) (G)	(Kw. hrs.) (H)	(I)
First block of 20 kw. hrs.	60.6%	59.2%	59.9%	189703	12300	202003	200106	1897	0.95%
Next block of 20 kw. hrs.	26.7	27.2	27.0	85509	12300	97809	97163	646	0.66
Next block of 60 kw. hrs.	12.7	13.6	13.1	41487	36900	78387	80930	2543	3.14
Next block of 50 kw. hrs.	.....	.....	.....	.....	22211	22211	22211	.....	.....
Block over 150 kw. hrs.	.....	.....	.....	.....	26817	26817	26817	.....	.....
TOTAL	100.0%	100.0%	100.0%	316699	110528	427227	427227	.....	.....

* Information obtained as result of a separate analysis of the 615 bills in excess of 100 kw. hrs. See Table IV-a.

period was obtained for Community X. This analysis had not been used in the earlier stages of this study. In Table IV-b, along with the kilowatt-hour distribution into blocks obtained by the "ready-made" method, there appears in Column G the distribution based on the actual detailed consumer analysis. The actual and percentage difference between the kilowatt-hour distribution series obtained by each of these methods is, as shown in Columns H and I, relatively small.

In Table IV-c are presented the present and proposed revenues of Community X based on both the "ready-made" and actual consumer analysis series of kilowatt-hour distribution appearing in Table IV-b. Inspection of Table IV-c will show that a calculation of present revenues based on the "ready-made" analysis varies only 0.38% from the revenues based on the detailed consumer analysis. Based on an assumed proposed rate, a calculation of revenues by the "ready-made" method varies only 0.18% from the revenues based on the detailed consumer analysis. Finally, the proposed revenue reductions, calculated on each basis, varies only 1.91%.

Consumer analyses of other communities not included in the above study were used to check the accuracy of this new method. In no instance did the calculation of either present or proposed revenues vary more than 2.00% from the revenues based on comprehensive consumer analyses. A consumer analysis which is 98% or better in accuracy is acceptable in practically all instances, since any calculation of future revenue based upon past consumption must usually in itself contain some error because of the changing use of service. At best,

TABLE IV-c COMPARISON OF PRESENT AND PROPOSED RESIDENTIAL ELECTRIC REVENUES BASED ON "READY-MADE" AND ACTUAL CONSUMER ANALYSIS FOR COMMUNITY X

		Present Rate		Proposed Rate		Revenue Reduction
		Rate	Revenue	Rate	Revenue	
Based on "Ready-Made" Analysis						
Total Number of Bills	11,732	.....	.....	60c†	$7,039	
Number of Minimum Bills	2,188	$1.00	$2,188	.....	.....	
Kw. hrs. in Minimum Bills	17,938	.....	.....	5c‡	$ 897	
First block of 20 kw. hrs.*	184,065	8.1c	$14.909	5c	9,203	
Next block of 20 kw. hrs.	97,809	6.3c	6,162	4c	3,912	
Next block of 60 kw. hrs.	78,387	3.6c	2,822	3c	2,352	
Next block of 50 kw. hrs.	22,211	2.7c	600	2c	444	
Block of over 150 kw. hrs.	26,817	2.7c	724	1.5c	402	
TOTAL	427,227	.....	$27,405	.....	$24,249	$ 3,156
Based on Actual Consumer Analysis						
Total Number of Bills	11,732	.....	.....	60c†	$ 7,039	
Number of Minimum Bills	2,188	$1.00	$ 2,188	.....	.....	
Kw. hrs. in Minimum Bills	17,938	.....	.....	5c‡	$ 897	
First block of 20 kw. hrs.*	182,168	8.1c	14,756	5c	9,108	
Next block of 20 kw. hrs.	97,163	6.3c	6,121	4c	3,887	
Next block of 60 kw. hrs.	80,930	3.6c	2,913	3c	2,428	
Next block of 50 kw. hrs.	22,211	2.7c	600	2c	444	
Block of over 150 kw. hrs.	26,817	2.7c	724	1.5c	402	
TOTAL	427,227	.....	27,302	.....	$24,205	3,097
Difference in Revenues and Reductions based on above Methods of Analysis	.....	.....	$ 103	.....	$ 44	$ 59
Percentage Difference	.....	.....	0.38%	.....	0.18%	1.91%

* Kw. hrs. in first block of 20 less those consumed in minimum bills.
† Fixed or service charge per bill.
‡ Since minimum bill under proposed rate is the fixed or service charge, all the kilowatt hours in the 1st block of 20 are figured at the 5c per kw. hr. rate.

a consumer analysis will indicate what the change in revenues will be with a change in rate if the identical use of the service is made in the future as was made during the past 12 months. A 100% accurate calculation of this change should not be demanded when it is known that future conditions will not be identical with past conditions. This does not imply, however, that a consumer analysis has no value because changes in character of use of electric service are generally a gradual process.

Most of the analyses which were studied represented communities served under a block meter rate. However, the findings in this study also apply to communities served under the various kinds of demand rates.

For example, a community being served under a room rate may have, for bills of 100 kw. hrs. and less, an average consumption of 22.3 kw. hrs. for the three-room customers, 26.8 kw. hrs. for the four-room customers, etc. Thus, the consumptions for each group of customers could, on the basis of the average consumptions per bill, be distributed into the various blocks. Caution will have to be exercised in applying the "ready-made" analysis in cases where there are less than 1,000 bills during a 12-months' period for any of the groups to be analyzed. Where the number of bills for any group of customers is less than 1,000, the probability of obtaining a "normal" distribution of bills from zero to 100 is greatly reduced.

Conclusions

The above study shows a definite relationship between the average residential consumption per bill, for bills of 100 kw. hrs. or less, and the distribution of consumption of such bills into blocks. Furthermore, the study shows that with a minimum of consumer data very accurate residential consumer analyses may be made at a considerable saving of expense as well as of time.

Although the study is based on consumer analyses of Wisconsin communities alone, the figures should prove to be reliable for all sections of the country, for the variations in the kilowatt-hour distribution series are dependent neither on the location of the community nor its population, but rather on the average consumption per bill. Furthermore, the curves developed apply whether residential lighting alone or total residential service, including appliances and electric ranges, is used. There are only five primary qualifications or limitations which should be followed carefully: (1) the distribution of kilowatt hours into blocks offered by the "'ready-made" analysis applies only to the consumptions of regular monthly bills (including minimum bills) of 100 kw. hrs. and less, and is based on the average consumptions of those bills alone; (2) the number and consumptions of minimum bills should be separately classified before they can be included in the "ready-made" analysis; (3) bills of over 100 kw. hrs. should be separately analyzed and used in conjunction with the "ready-made" analysis to estimate revenues under various rates; (4) it is recommended that there be at least 1,000 bills for each community or group of consumers to be analyzed by this method; and (5) interpolations for "blocks" which do not appear in Table III should be made directly from Chart III.

Erosion and Land Utilization in the Driftless Area of Wisconsin[1]

By MELVILLE H. COHEE

WITHIN the last decade soil erosion as an active agency in the reduction of fertile soils to a state of non-productivity has become recognized as a major land problem in the United States. Secretary of Agriculture Wallace stated a year ago that erosion had totally destroyed 34 million acres of one time arable land, and that another 125 million acres had been injured more or less.[2] In other words, an area almost the size of the State of Wisconsin has been devastated by this insidious process and another area embracing 30% of all land in crops has been seriously impaired. All too often the spectacular gully with its outwash area below attracts attention, but these easily observable gashes in the earth's surface are usually of minor importance compared to the damage caused by sheet erosion which is not so visible to the ordinary observer. Both types of soil washing remove the earth itself from where nature originally placed it. Some of it is merely moved to lower places where it fills depressions, clogs streams, and covers roadways. The finer material remains suspended in the water and eventually reaches the ocean, forming the deltas at the mouths of the rivers. It is estimated that the Mississippi delivers 370 million tons of suspended material each year into the Gulf of Mexico.[3] En route it forms sand bars and interferes with navigation.

[1] Based on a study made by the writer in August, 1933 under the direction of Professors George S. Wehrwein and Noble Clark of the Agricultural Experiment Station, University of Wisconsin, with funds granted under University Research Project 33:28.

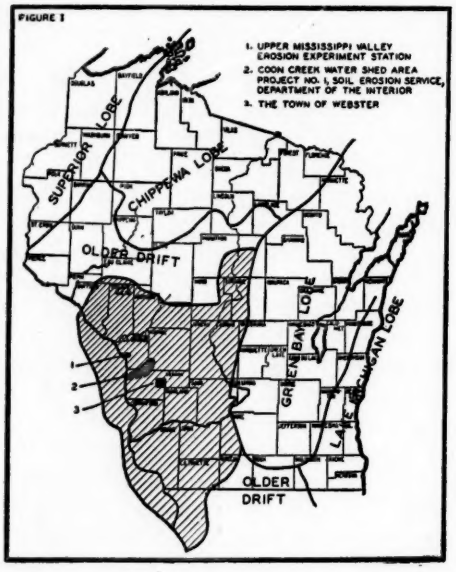
The Driftless Area

The Upper Mississippi Valley has an erosion problem on its thousands of acres of steep and rolling topography. Most important in this respect is the "Driftless Area" located in Wisconsin, Minnesota, Iowa, and Illinois. This area covers nearly 15,000 square miles of which 13,360 lie in Wisconsin, embracing wholly or in part 23 counties of the southwestern part of the State (Figure 1). This region is unique in its geological history and appearance. During the Glacial Period the ice sheets came as far south as the Ohio and Missouri Rivers but passed around this area leaving the landscape undisturbed, thus permitting the earlier geological forces to continue their work uninterruptedly. Instead of rounded hills, glacial swamps and lakes, soils ground and mixed by the ice, here a nearly level lake bed has been carved by the streams so that the Mississippi now lies 500 to 600 feet below the present level of this ancient lake floor. Smaller streams have worn relatively narrow but deep valleys into the terrain. In some places the valleys are so close together that the remaining ridges have sharp tops; but in other places a part of the level plateau remains. Small valleys or "coulees", made famous by Hamlin Garland's stories, cut into the hills from the main valleys. During the period when the streams flowed at higher levels they

[2] *Rural America*, September, 1933.

[3] Bennett, H. H. and W. R. Chapline, "Soil Erosion, a National Menace", United States Department of Agriculture, *Circular 33* (1928): 1–36.

built up layers of sand and silt in the valleys. As the rivers wore deeper, these deposits were left as terraces or "benches." Finally, there are the present valley bottoms where the streams now have their courses.



The peculiar hill and valley structure has influenced many of the cultural features of the region. Roads do not follow the rectangular survey lines but rather the valleys and ridges. Railroads have also sought the level valleys and wind in and out with the streams. School district boundaries and even town boundaries have been adjusted to natural conditions in some localities, thereby losing their customary square forms. On the other hand, the rectangular survey has forced square or oblong farms upon a very irregular topography. Only on extensive ridges or in a wide valley will a farm consist entirely of level land; more frequently it will be partly level and partly hillside. Some farms have both ridge and valley land with steep slopes connecting them.

Factors Which Influence the Extent of Erosion

The amount of erosion depends primarily on the type of soil, the amount and character of the rainfall, the steepness of the slopes, and the manner in which the land is utilized. Compared to the other critical erosion area of the United States the soils of the Driftless Area are not easily eroded except the loess soils and the terraces. Nor is the rainfall in this area excessive. The region receives about 31 inches per year, fairly well distributed. However, the "hard" sudden rain does the most harm. Such rains are not unknown; their prevalence is roughly indicated by the fact that between 1915 and 1929 the average number of rains per year of one inch or more in 24 hours was about 6, ranging from 3 in 1929 to 10 in 1928.[4] The critical factors of this Driftless Area are primarily the steepness of the slopes and the utilization of the land. If the rain falls on level or gently rolling ground it has a chance to sink quickly into the soil, but if it falls on a steep slope it is more likely to run over the surface gaining velocity as it goes. The importance of the steepness of the slope becomes apparent if it is remembered that doubling the velocity of a stream increases its carrying capacity 64 times.

The amount of run-off also depends upon the condition of the ground as well as the pitch of the slope. Water falling upon impervious rocks will all run off and thus be termed "100% run off." On the other hand, all soils are more or less porous and will absorb some of the rainfall, the exact amount absorbed depending upon the kind of soil, the cover, and the steepness of the slope.

[4] C. G. Bates and O. R. Zeasman, "Soil Erosion—A Local and National Problem", Wisconsin Agricultural Experiment Station, *Research Bulletin 99*, pp. 15-42 (1930).

A few years ago a study was made in the Driftless Area of the run-off from land in the various uses or conditions of cover.[5] Table I presents a summary of the findings of this study. Since the measurements were made on slopes of various steepness they are not strictly comparable, but an average has been computed for each land use and is shown in the last column. Steepness of slope is expressed in percentages which can be visualized by the following example. If a hill or a roof "rises" one foot for every 10 feet horizontal distance, it is said to have a 10% slope. A rise of 100 feet in 100 feet would produce a 100% slope and is the same as an angle of 45 degrees. On paper this does not look very steep, but if it is recalled that few highways are built with grades of as much as 15 or 18%, the steepness of a 36% slope will be appreciated.

TABLE I. MAXIMUM RUN-OFF RATES UNDER VARYING CONDITIONS IN THE DRIFTLESS AREA, SUMMER, 1929

Land Use	Number of Measurements	Average Maximum Run-off	Average Steepness of Slopes
Forests	12	2.8%	36.3%
Wild pasture, native grasses	5	7.2	34.3
Cultivated hay	3	17.7	15.3
Small grain and fallow	6	25.6	15.0
Corn	6	25.7	15.2
Seeded pasture, mostly blue grass	7	26.7	31.6

What Table I really shows is the converse of the absorbing power of the soil. In the case of forests, in spite of an average slope of over 36%, only 2.8% of the water flowed over the surface to become the eroding agent. Wild pastures of heavy grass, porous and full of humus, had a run-off of only 7.2%. On the other hand, cultivated hay on a much gentler slope had more than twice the volume of run-off as the wild pasture land. The most striking example of run-off is from pasture land where close cropping and packing of the soil caused it to shed water almost like a roof.

While there can be no erosion without run-off, there may be run-off without erosion. The study by Bates and Zeasman showed that both forests and seeded pastures, the two extremes as far as run-off is concerned, lost very little soil, whereas water flowing over the loosened ground of cultivated land picked up appreciable amounts of material. Cultivated crops such as corn are most conducive to erosion, especially if the rows run up and down the slope.

Quantitative measurements of erosion as related to cover and slope have been made at the Upper Mississippi Valley Erosion Experiment Station located near La Crosse. It was found that on land sloping 16% planted with corn, the tract being 72.6 feet between the lowest and highest points of the slope, there was a run-off of 22.4% from August 1, 1932 to July 31, 1933, resulting in a loss of 77.3 tons of soil per acre. Where the length of the field was doubled, the percentage of run-off was no greater but the soil loss was 91.5 tons per acre. A barley tract of the same dimensions and slope had a run-off of 21.6% and lost only 13.7 tons per acre, whereas a hay tract lost only 1.04 tons of soil with a run-off of 15%. The best showing was made by a plot with unclipped blue grass on a 30% slope on which a run-off of 9.3% carried away only .03 of a ton of soil per acre during the 12 months under observation.[6]

These data show how complex the erosion problem can become. In the one case blue grass yielded the least run-off;

[5] *Ibid*, pp. 71-72, especially tables 9 and 10.

[6] Unpublished data furnished by the director of the Upper Mississippi Valley Erosion Experiment Station, United States Department of Agriculture.

in the other, most. The difference lay in the fact that in the former case the pastures were closely cropped and the soil was packed hard, whereas in the latter the blue grass was not even cut. The explanation of the effectiveness of grass in promoting the water-absorbing capacity of the soil is that the grass cover prevents the rain from muddying the soil. Muddy water soon fills and plugs the tiny spaces between soil particles and tends to make the surface impervious. Clear water, on the other hand, soaks into the ground very readily. This has further significance when the relation of one land use to another is considered.

Paradoxically, in the last three or four years the dry weather in early spring and summer has speeded up erosion. These unusually dry weather conditions have caused many hay and grass seedings to fail, reducing the effectiveness of the grass cover and increasing erosion. In many cases the same hillsides have been in grain three and four years in succession as a nurse crop to hay and grass seedings that have failed. Some of the failures have been attributable partially to the open winters which have been unusually common in this area in recent years; this, coupled with dry spring and summer conditions, has caused failure after failure of new seedings. Furthermore, the pasture grasses have been exceedingly short and it has been hard to maintain good pasture sods which help so much to hold water and lessen erosion.

Present Utilization of Land in the Driftless Area

Originally the Driftless Area was covered with forests and the few open prairies had a blanket of heavy sod of native grasses, both of which have high water-absorbing power. Erosion was at a minimum, though by no means absent. Settlement began in this part of Wisconsin about 1820 when the Cornish miners arrived to exploit the lead and zinc deposits. Farmers soon followed. Their choice of the level land was not only dictated by the fertility of the soil but by the nearness to springs and access to roads and trading centers. But as population increased and more land was needed, the steeper lands were cleared and grazed. The original balance of nature was disturbed; erosion set in, slowly at first, because the original soil even after clearing was filled with humus and acted like a sponge. However, after this tenacious top soil was gone the process became more rapid. Other man-made features accelerated the run-off, such as road cuts and fills, changing and straightening of stream channels, and the discharge of storm sewers of cities and villages.

At the present time about 42% of the land is under cultivation; 10% of all the land is in permanent plowable pasture; and 15% is devoted to permanent pasture, not plowable; and the remaining 33% is still in timber and woodlots. The climatic and soil conditions make possible diversified crop production. Small grains, such as wheat, barley, and oats, are raised, with oats the leading grain crop. These grains utilize a little more than ⅓ of the cultivated area. Over most of the area corn is raised chiefly for silage; the corn acreage constitutes from 1/6 to ⅕ of the total crop acreage. Hay lands make up ⅓ of the total crop lands; as yet alfalfa has not become the leading hay, but is having a wider use every year. This greater use of alfalfa is coming about chiefly because the leading live stock enterprise of the area is dairy cattle with butter and cheese as the chief market products. Some hogs, sheep, and beef cattle are raised but by far

the greatest live stock business is found in the dairy cattle. However, in two or three counties the tobacco crop held first place in importance relative to total farm receipts during the decade ending in 1932. Because of a collapse of the market for the type of tobacco grown in Wisconsin, this crop has been greatly reduced.

Man cannot change the character of the soil or rainfall, nor the steepness of the slope, but he can prevent, or at least mitigate, erosion by fitting land utilization to the slope and soil. The above enumerated land uses, if properly adjusted to the natural conditions of the area, might cause no more erosion than far less broken land not so well adjusted.

The Study of Land Use as Related to Steepness of Slope

In order to discover the actual utilization of the land in the Driftless Area and relate the utilization to the critical factor of steepness of slope, a study was made in the summer of 1933 of 30 representative farms in the Town of Webster, Vernon County. These farms covered a total of 3,290 acres and were selected with a view to obtaining a representative sample of the utilization of all types of land-valley bottoms, ridges, and the steep slopes. Of these 3,290 acres 203 acres were in roads, lanes, farmsteads, etc., leaving 3,087 acres to to be used in the calculations.

Viewed in cross section, a typical hill of this area consists of the main slope 10 to 18 rods long with 6 to 8 rods of ridge land and valley-land at the top and bottom (Figure II). The ridges themselves consist of some sloping land leading to the nearly level top above. The valley also consists of both sloping and flat land. Over 60% of the land on these 30 farms has a slope of less than 15%, but an appreciable area, 10.1% to be exact, has a slope of over 40% as shown in Table II.

How various crops are distributed by slope intervals is shown on the same table. While almost ½ of the corn is to be found on slopes of 0-5%, ⅓ of it is being grown on land having a slope of 10% or more. Half of the grain is grown on slopes of 10% and above; in fact, some of it is on land with a slope of 40% or more. On the other hand, hay which

TABLE II. PERCENTAGE DISTRIBUTION OF LAND BY LAND USES, AND BY SLOPE INTERVALS ON 30 FARMS, TOWN OF WEBSTER, VERNON COUNTY, WISCONSIN, AUGUST, 1933.

Slope Intervals	Percentage of Land in Slope Interval	Cleared Permanent Pasture	Woodlands	Hay	Grains	Corn
0-5%	25.2%	35.76%	4.78%	25.87%	23.83%	49.31%
5.1-10	13.7	6.85	8.72	19.05	24.16	17.52
10.1-15	22.0	20.24	9.62	30.28	32.94	23.28
15.1-20	12.6	11.29	9.23	18.69	13.20	7.79
20.1-25	5.2	5.83	7.52	3.61	5.21	2.10
25.1-30	2.6	3.72	5.29	1.27	.....	.....
30.1-35	2.0	2.99	3.82	.62	.13	.....
35.1-40	3.0	3.01	7.99	.49	.40	.....
40.1-45	3.6	2.73	10.99	.12	.13	.....
45.1-50	2.9	2.48	8.72	.....	.....	.....
50.1-55	3.3	1.48	11.59	.....	.....	.....
55.1-60	2.5	2.68	7.07	.....	.....	.....
60.1-65	1.0	.75	3.12	.....	.....	.....
65.1-70	.4	.19	1.34	.....	.....	.....
	100.0%	100.00%	100.00%	100.00%	100.00%	100.00%

retards erosion and is therefore desirable on the steeper slopes is distributed in about the same way as the grain, largely because it is rotated with corn and grain. Permanent pasture is largely found on slopes of 20% or less, and yet, if properly managed, can be used to prevent erosion on the steeper slopes. Woodland, which might be used exclusively to protect the steeper slopes, is found in a surprisingly even distribution in all grades of steepness but in slightly higher proportion on land with a 40 to 55% slope. It is interesting to note that ¼ of the land has a slope of 5% or less; in comparison, almost 36% of the permanent pasture, 26% of the hay, 24% of the grain, and ½ of the corn is being grown on this slope interval. Less than 5% of the woodland is to be found on this slope interval.

FIGURE II

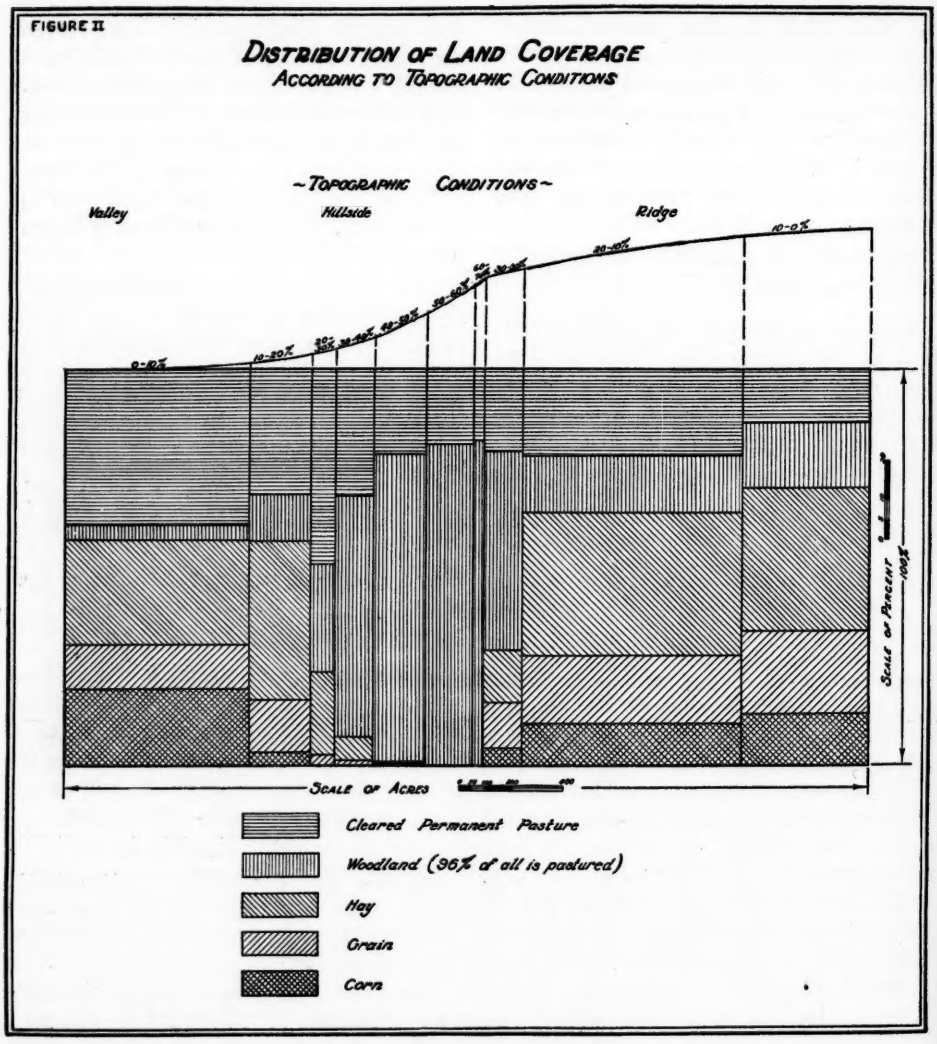


TABLE III. PERCENTAGE DISTRIBUTION OF SIMILAR SLOPING LAND AREAS ACCORDING TO COVERAGE FOUND THEREON ON 30 FARMS, TOWN OF WEBSTER, VERNON COUNTY, WISCONSIN, AUGUST, 1933.

Slope Interval	Cleared Permanent Pasture	Woodlands	Hay	Grains	Corn
0-5%	37.06%	4.82%	26.95%	11.61%	19.56%
5.1-10	13.05	16.17	36.42	21.61	12.75
10.1-15	23.97	11.09	36.05	18.34	10.55
15.1-20	23.40	18.63	38.96	12.85	6.16
20.1-25	29.10	36.54	18.11	12.23	4.02
25.1-30	36.69	50.77	12.54	.....	.....
30.1-35	40.34	50.42	8.40	1.84	.....
35.1-40	26.21	67.84	4.32	1.59	.....
40.1-45	20.00	78.60	.90	.50	.....
45.1-50	23.00	77.00	.....	.....	.....
50.1-55	11.65	88.35	.....	.....	.....
55.1-60	27.93	72.07	.....	.....	.....
60.1-65	19.67	80.33	.....	.....	.....
65.1-70	12.50	87.50	.....	.....	.....

Some of the flat land consists of overflow land near the streams and is better suited to hay, pasture, or woodland than to grain or corn.

How each succeeding slope interval is utilized is indicated by Table III. The relative amount of land in each slope interval (Column 2 of Table II) and its distribution among the various uses are both significant.

Table III shows that corn occupies almost 20% of the level land (0-5% slope). It holds a less prominent place on steeper slopes; nevertheless, land with a 20 to 25% slope has 4% of its area in corn land. It is noteworthy also that the steep slopes which so desperately need the protection that forests afford have been cleared—almost 28% on the 55 to 60% slopes and 12.5% on the very steepest part of the hillsides. No longer in woodland, they are now grazed as permanent pastures, which may produce the maximum run-off if not properly handled.

The tables so far presented show the use of the land by degree of slope irrespective of the proportion of the farm this slope interval may be. Figure II, however, shows that there is a 0-5% slope on the ridge as well as in the valley. Table IV is therefore presented to show the entire slope, consisting of two valley sections with slope ranges of 0-20% and 20-30%, two similar sections on the ridge, and a connecting hillside portion with a slope range of 30 to 70%. The area of these five sections, however, is very unequal. The "valley slope" land covers only 95 acres, whereas the level valley and ridge land occupy 937 acres and 1,332 acres, respectively. Next in size is the area occupied by the steep slopes (574 acres), whereas the sloping land on the ridge covers only 148 acres.

Perhaps the most significant fact to be gleaned from this table is that it tends to show the land uses in their relation to each other as one goes from the valley to the peak of the ridge. This is important because the erosion problem is complicated by the fact that the run-off from one land use may become the eroding agent on the fields below it. Although the compact pasture erodes very little, the high percentage of run-off (especially if the water is muddy) menaces the cultivated part of the farm below, even though the slope is fairly gentle at this particular point.

The flat or gently sloping ridges act like roofs if they are in uses which shed the rain, and the accumulated water passes over the edge of the plateau at some low point on its way to the stream in the valley. Many acres of valley land are ruined each year by the scattering of rocks and debris brought from the slopes and uplands. Such a stream may even tear its way through a piece of woodland and deposit its debris on a highway or on another man's farm. Seventy percent of the area of the 30 farms consists of ridge lands and hillsides which shed water onto the lower lands. The proper utilization of the 70% is of vital importance to the 30% lying in the valley. Truly it can be said no land lives unto itself in the Driftless Area!

If these farms are used as fair samples of the entire township and if only the cultivated land with a 15% slope or more is considered, it is safe to say that the 36 square miles of land which make up the Town of Webster lost at least 19,576 tons of soil during the fiscal year for which records were kept at the Erosion Experiment Station. This loss would be from only ⅓ of the land area of the Town, since cultivated land with a gentler slope was omitted, as were pasture and forest lands. If this same rate of erosion is assumed for the 15,000 square miles of the Driftless Area, the total soil losses take on staggering proportions.

TABLE IV. PERCENTAGE DISTRIBUTION OF LAND COVERAGE ACCORDING TO SLOPE OF THE LAND AND TOPOGRAPHIC LOCATION ON 30 FARMS IN THE TOWN OF WEBSTER, VERNON COUNTY, WISCONSIN, 1933.

Topographical Location	Coverage	Slope of Land						
		0–10%	10–20%	20–30%	30–40%	40–50%	50–60%	60–70%
Valley Land (937 Acres)	Permanent pasture	39.1%	31.3%	.....	.....	.....	.....	.....
	Woodland	3.7	11.8	.....	.....	.....	.....	.....
	Hays	26.4	40.2	.....	.....	.....	.....	.....
	Grains	11.1	13.2	.....	.....	.....	.....	.....
	Corn	19.7	3.5	.....	.....	.....	.....	.....
Valley Slope Land (95 Acres)	Permanent pasture	.....	.....	48.9%	.....	.....	.....	.....
	Woodland	.....	.....	27.3	.....	.....	.....	.....
	Hays	.....	.....	21.0	.....	.....	.....	.....
	Grains	.....	.....	2.8	.....	.....	.....	.....
	Corn	.....	.....	.....	.....	.....	.....	.....
Steeper Sloping Land (574 Acres)	Permanent pasture	.....	.....	.....	31.8%	21.1%	18.6%	17.6%
	Woodland	.....	.....	.....	61.0	78.2	81.4	82.4
	Hays	.....	.....	.....	5.9	.5	.....	.....
	Grains	.....	.....	.....	1.3	.2	.....	.....
	Corn	.....	.....	.....	.....	.....	.....	.....
Ridge Slope Land (148 Acres)	Permanent pasture	.....	.....	20.6%	.....	.....	.....	.....
	Woodland	.....	.....	50.3	.....	.....	.....	.....
	Hays	.....	.....	13.2	.....	.....	.....	.....
	Grains	.....	.....	11.5	.....	.....	.....	.....
	Corn	.....	.....	4.4	.....	.....	.....	.....
Ridge Land (1332 Acres)	Permanent pasture	13.3%	21.7%	.....	.....	.....	.....	.....
	Woodland	16.3	14.4	.....	.....	.....	.....	.....
	Hays	36.0	36.3	.....	.....	.....	.....	.....
	Grains	21.0	17.2	.....	.....	.....	.....	.....
	Corn	13.4	10.4	.....	.....	.....	.....	.....

Pasture and Forest Land Uses

It is encouraging to find 61 to 83% of the steeper slopes and over 50% of the ridge land with a slope of 20 to 30% in woodland. The second largest use is permanent pasture. However, the mere fact that the steeper slopes are in pasture or forests does not mean that the soil is adequately protected. Forests, which in their natural state have so little run-off and erosion, lose these qualities when grazed. Cattle eat the young tree sprouts and ground coverage and they pack the soil, thereby reducing its water-absorbing capacity. As the old trees die or are cut for firewood or other uses, there are no young trees to take their place. Grass replaces the porous leaf mold and the woodlands become mere open groves with no more water-holding capacity than open, closely grazed pasture. Since this is a dairy country, grazing land is much desired and in some parts of the Driftless Area, especially in the past, farmers hastened the transition from forests to pasture by burning over the woodlands. Cattle also make paths on the steep hillsides which give run-off water an entry through the sod. Fully 96% of the woodland on the 30 farms of the Town of Webster was grazed. The farmer somehow feels that every acre of woodland pasture is an acre gained irrespective of the damage to the woodlot or the increasing danger from erosion, in spite of the fact that the wooded hillsides of 30 % or more slope have very little desirable pasture grass.

One would suppose that it is the farmer with a small farm or the one with comparatively few acres of open pasture who is forced, as it were, to pasture the steep slopes and woodlands. However, Table V shows that the farmer with an abundance of other pasture is quite as likely to graze his woodlands as are farmers who are not so favored. No apparent correlation was found between the animal units per farm and the acreage of the different kinds of pasture available to the farmer.[7]

During the period of high prices for dairy products there was a tendency to increase the herd and supplement the home grown feeds and pastures by buying additional feeds. With the present low prices for farm products it does not pay to buy feeds and many a farmer is trying to maintain the same sized herd by over-grazing his permanent pastures and woodlands. This has increased the tendency to run-off and erosion as one would expect. Either the farmer should reduce his herd to fit his feed resources as they now stand, or he should add fertility to his pasture. Fertilization will not only increase the carrying capacity of the pastures but the better sod will reduce the run-off which means less erosion and helps to reduce flood hazards.

If timber and heavy sod are so important in maintaining the very soil itself, why are clearing of land and overgrazing of pastures and woodlands continued? As has been suggested, during the years of high prices for dairy products, grain, corn, and tobacco, this was done to get more "productive" acres, whereas forests seemed to have a mere negative value. Steep lands became supermarginal at these prices; now they are submarginal once more, but the utilization remains. Forests are not created over night nor is an over-grazed woodland restored to a protective forest in a day. Furthermore, clearing continued after the depression set in. Almost 3,000 acres were cleared and made

[7] An "animal unit" is a term used in farm management. It is the number of live stock considered equivalent to one cow as a consumer of feed and producer of fertilizer. One horse, one cow, 5 hogs, 7 sheep, or 100 head of poultry are each considered one "animal unit."

suitable for crops from 1920 to 1924 in Vernon County according to the *Census* of 1925, and the 1930 *Census* reported the value of forest products cut on the farms for sale and home use in 1929 as $525,212. If the 183,000 acres of forest land of Vernon County were left ungrazed, were properly managed and selectively logged, they could easily yield this amount of forest products annually without depleting the forest. As now handled, it means a depletion of the original forest capital, more cleared or grazed land, and more acreage exposed to run-off and erosion.

Public Policies for Erosion Control

The repercussion of changes in the price level on the method of land utilization needs further investigation. We must also know more about the effect of public policies on the action of farmers in relation to their land before we can form a land policy which will accomplish definite objectives. What, for instance, is the effect of our present tax system? Taxes are high and more land is tax delinquent in the Town of Webster at the present time than at any period since that following the Civil War. During the years of prosperity, assess-

TABLE V. ANIMAL UNITS AS RELATED TO TOTAL FARM ACRES AND ACRES OF DIFFERENT COVERAGE, 30 FARMS IN TOWN OF WEBSTER, VERNON COUNTY, WISCONSIN, AUGUST, 1933.

Farm Number	Total Acres in Farm	Animal Units* (Cattle & Horses)	Permanent Pasture		Woodland		Hays		Cultivated Land	
			Acres	Acres Per Animal Unit	Acres	Acres Per Animal Unit	Acres	Acres Per Animal Unit	Acres	Acres Per Animal Unit
25	40	6.0	9.0	1.50	14.0	2.33	7.0	1.83	15.5	2.50
7	38	9.5	19.5	2.05	2.0	.21	4.0	.42	12.5	1.31
2	80	9.5	22.0	2.32	24.0	2.53	20.5	2.16	30.5	3.37
20	50	14.5	13.5	.93	2.5	.17	23.0	1.59	31.0	.46
5	94	14.7	14.0	.95	46.0	3.12	20.0	1.36	29.5	2.00
3	80	15.5	16.0	1.03	11.0	.71	25.0	1.61	47.5	3.06
27	92	15.7	32.0	2.03	18.0	1.43	12.0	7.6	37.0	3.35
18	80	16.2	11.0	.68	3.0	.18	27.0	1.66	62.0	3.82
16	96	18.0	19.5	1.08	22.5	1.25	19.5	1.08	50.0	2.77
14	80	19.0	14.0	.74	35.0	1.84	11.0	.58	26.7	1.41
8	61	19.0	34.0	1.79	0.0	.....	9.0	.47	21.0	1.11
13	80	19.2	14.0	.73	22.5	1.17	20.0	1.04	42.0	2.19
22	149	20.5	34.0	1.66	58.5	2.85	27.0	1.32	48.5	2.83
23	118	20.5	9.5	.46	71.5	3.48	16.5	.80	29.0	1.41
19	120	21.0	36.0	1.71	23.0	1.09	31.5	1.50	56.0	2.67
21	80	21.5	22.0	1.02	19.0	.88	16.5	.77	35.0	1.63
6	160	23.7	29.0	1.22	40.0	1.68	60.0	2.53	86.0	3.63
10	97	24.0	33.0	1.38	13.5	.56	20.0	.83	35.5	1.48
12	78	24.5	12.0	.49	4.5	.18	34.5	1.41	56.5	2.31
1	76	24.7	27.5	1.11	0.0	.00	29.0	1.72	45.5	1.84
28	160	26.0	47.0	1.81	22.5	.87	38.5	1.48	71.5	2.75
24	110	26.5	27.5	1.04	34.0	1.28	17.5	.66	43.0	1.62
17	90	26.7	30.5	1.14	3.0	.12	30.0	1.21	53.5	2.00
4	160	27.5	36.0	1.31	56.0	2.02	44.0	1.60	63.0	2.29
9	200	28.0	41.0	1.46	51.0	1.82	59.0	2.11	93.0	3.32
29	170	33.5	12.0	.36	83.0	2.48	49.5	1.48	72.0	2.12
15	160	33.7	42.5	1.26	35.0	1.04	31.5	.93	71.0	2.11
30	130	35.0	15.5	.44	34.5	.99	45.0	1.29	64.5	1.84
11	120	41.0	21.0	.51	35.5	.87	30.0	.73	55.5	1.35
26	240	45.5	111.0	2.44	0.0	.....	69.0	1.52	112.0	2.46

*Cattle and horses comprise 87% of the total animal units, (76% and 11%, respectively) and nearly 100% of all pasture animal units.

ments and taxes were raised tremendously and, although taxes have been reduced somewhat, they are still out of line with farm prices. Assessments are not in accordance with the economic productivity of the land. Timber and pasture lands are taxed too high compared with crop lands and better soils. This has a tendency to encourage the use of land for crops even though it is best suited to timber, and to discourage reforestation and the proper management of woodlots from the forestry standpoint.

It should be said, however, that farmers of this area are not entirely unmindful of the erosion problem. The tables and chart show average conditions. There are farms with land uses suitably adjusted to slope but there are others where this is not the case. The latter usually consist of sloping land only and the owner is obliged to use steep land for crops and pastures. As a rule, farmers try to cope with gullies as fast as they appear. It was interesting to observe that the tenants followed practically the same land utilization practice as the owners. This is not without significance, since 38% of the farmers of the Driftless Area are tenants and 35% of the farm area of Webster is operated by renters.

The prevention and control of erosion present a complicated problem. From one standpoint erosion might be considered the private affair of the farmer. However, the question has been raised whether one farmer has any right to inherit fertile lands from his father and pass barren, devastated hillsides to his son. Even this is a narrow point of view. Can we permit one generation to waste natural resources which belong to *all* generations? Aside from these philosophical considerations, what about the right of one farmer to damage the land of another through neglect or mismanagement of his soil? What about the cost to local governments when roads have to be cleared of rocks and earth after every heavy rain and bridges have to be replaced after being torn away by floods? What about the spoiling of trout streams, riparian erosion, and silting of rivers? Erosion within the line fence of a given farm affects the interests of individuals and governments from the township all the way up to the Federal Government. Yet the complete prevention of erosion or the restoration of a gullied farm is in many cases beyond the financial power of an individual farmer even if he has the knowledge and capacity to do it. The "New Deal", however, is permitting us to enter a new field of experimentation. Without giving up the principle that the farmer as land owner has the chief responsibility in protecting his farm from erosion, public agencies are cooperating with farmers to the end that further inroads of this "National Menace" may be prevented and the wounds healed. The Driftless Area has such an experiment in the Coon Creek Water Shed Area Project of the Soil Erosion Service of the Department of the Interior, located near La Crosse, Wisconsin. To discuss this program, however, is beyond the intent of this article.

I. Rationalization of Electricity Supply in Great Britain*

By MELVIN G. DE CHAZEAU

TO SAY that we are in the midst of a new industrial revolution may be exaggeration. But no economist can blind himself to the cumulative shift, during the past few decades, from the planless economy of self-interest to one dominated by social control. The inherent weakness of competitive capitalism—that the price competition of companies with large fixed capital is self-destructive and socially ruinous when it is not mythical—was, naturally, first evidenced in those industries supplying a necessary service in markets restricted by the requirement of physical connection to the consumer. Adequate public utility service was discovered, after long and painful experience, to be inconsistent with competition; and, grudgingly, the principle of regulated monopoly has been applied in this field.

Now it is one thing to convince the average man that regulation is necessary, and quite another to make him realize the economic and technical requirements of effective control. It is more difficult still to make him see the necessity for intelligent social planning if regulation is to be more than a checkrein to private greed. Regulation in the United States may have destroyed the physical existence of competitive capitalism, but has never supplanted its prejudices or its mode of thinking. The spirit of competitive profit and vested privilege in the control of capital has muddled the deliberations of legislatures, stultified the activities of regulating commissions, and confused the solemn pronouncements of courts. It has precluded public appreciation of regulation's fundamental objectives and the significant limitations upon property rights which regulation admittedly involves. Unplanned, without adequate financial support, embarrassed by too much jurisdiction and too little power, handicapped by litigation, it is not surprising that regulation is now on the defensive, that a growing number of commentators and administrators admit its failure. It is an interesting reflection upon American regulation that, if one seeks unqualified support of the existing system, one must go, not to the students of public utilities nor to members of the more efficient state commissions, but to the companies subject to regulation, who would lose most by effective control.

At a time when Americans are becoming intensely skeptical of the soundness and feasibility of our "solution" of the public utility problem—namely, private ownership and operation of utility properties subject to the regulation of state or national commissions—Great Britain has developed a unique compromise between private property and government control which should be of interest to every student of social control of industry in this country. The British plan is premised upon the assumption that the era of the isolated generating station is past. This is not

* The data for this study were gathered while the writer was a Fellow of the Social Science Research Council in 1932-33. I want to express my deep appreciation of the cordial assistance rendered me by all the officers of the Central Electricity Board, and especially by Mr. H. Quigley, Chief Statistician of the Board, whose aid and advice were invaluable.

new. We are familiar with wide interconnection of generating stations in the United States under the egis of holding companies; and economies attributable to such systems need not be recounted here.[1] What *is* new for us is that the British scheme provides for the control of generation and transmission of energy up to the point of the main distribution substations.

The most efficient generating stations in Great Britain are interconnected by a superpower network of primary transmission lines, operating at 132 kilovolts, from which secondary ring mains at 66 and 33 kilovolts provide a source of energy for the smaller distributors.[2] This high tension transmission system, with its switching and transforming stations, its control rooms and communication lines, is known colloquially as "the grid" and will be so designated in this paper. The grid has been constructed and is owned by the Central Electricity Board (C. E. B.), a non-profit-making corporation set up under the Electricity (Supply) Act, 1926.[3] The C. E. B. determines the operating program and directs the operation of (but does not own) the public generating stations which have been selected for use on the basis of their efficiency, and it may contract for energy from private stations outside the system. All energy produced by selected stations[4] is purchased by the Board, at a price equivalent to cost of production, and resold to owners of these stations and to other distributors at a price which is estimated to cover all C. E. B. expenses over a ten-year period. The planning and construction of the grid were not left to private enterprise and the stimulus of the profit motive. Neither the selection of generating stations for the production of energy to be fed into this superpower system and resold to distributors nor the direction of the operation of those stations selected for the purpose is entrusted to private initiative.

In contrast to American regulatory practice, social control is thus applied at the source of supply. The gargantuan task of fixing price to the ultimate consumer, with little knowledge and less control of operating costs and system economies, is avoided. The development of interconnected systems in which the dominating considerations have been too often financial advantage rather than operating efficiency, is precluded. Economies which may be obtained through load concentration upon the most economical sources of supply are made available to the consumer, instead of being absorbed in excessive holding company profits or made to

[1] Almost any standard text in public utility economics may be consulted for a description of the economies attributable to super-power systems on the one hand and holding companies on the other. For instance Glaeser, Martin G., *Outlines of Public Utility Economics* (New York: Macmillan Co., 1927), pp. 66-7 and 94-6; Bonbright, J. C. and Means, G. C., *The Holding Company* (New York: McGraw-Hill, 1932), Chs. V, VI and Supplement to Ch. VI.

It is not implied above that there is *no* place for the isolated plant. The cost of transmission together with the efficiency of the small Diesel engine and the price of oil all set a variable limit to the economic extension of any interconnected system.

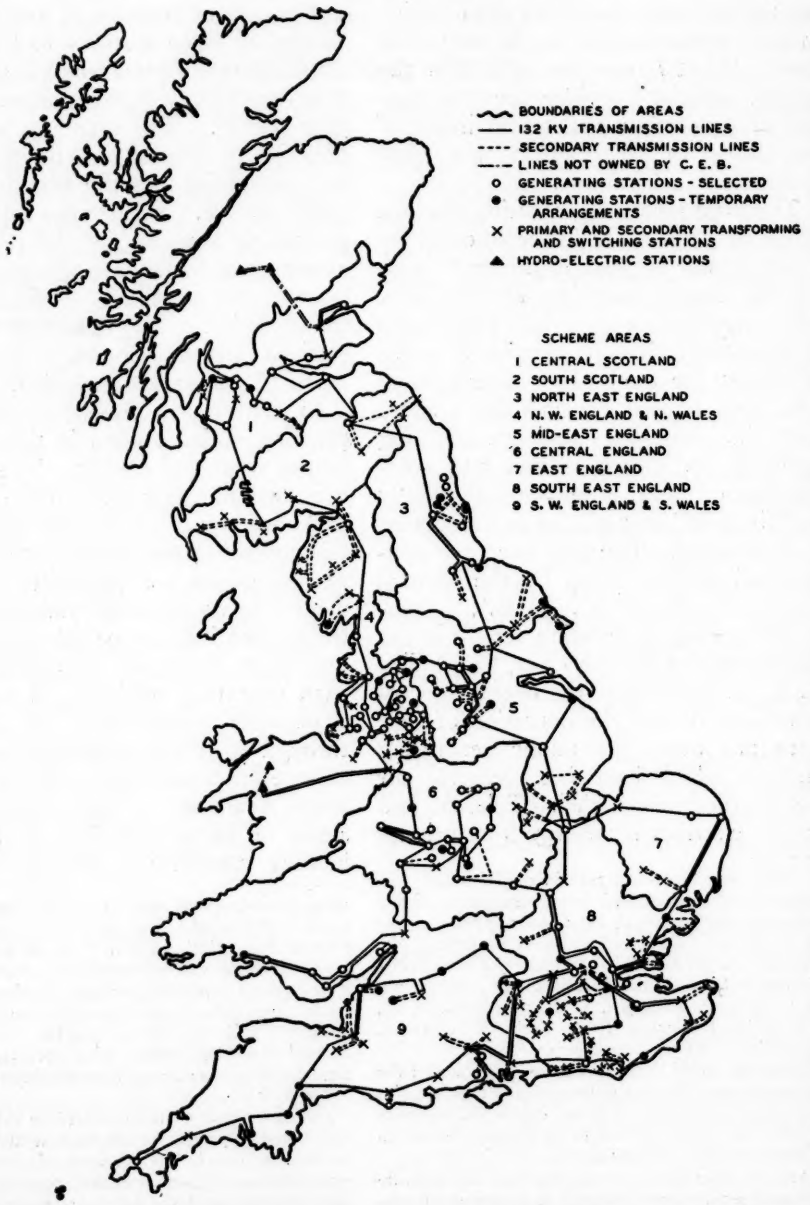
[2] A glance at the accompanying map will indicate the main set-up of this system. It comprises approximately 3,000 miles of primary and 1,000 miles of secondary lines; 273 transforming and switching stations through which supplies will be furnished, and seven central control rooms with their communication systems from which, in each "scheme area" (South Scotland is operated as a part of Central Scotland, East England as part of South-East England), the day to day operations of the generating stations and the associated grid lines will be directed. C. E. B., *5th Annual Report*, December, 1932, pp. 3-4. The map reproduced here is adapted from this *Report*.

[3] 16 & 17 Geo. 5, Ch. 51.

[4] When a "scheme" is formulated by the Electricity Commissioners, certain generating stations are selected by them (subject to C. E. B. approval), after technical examination, on the basis of their potential efficiency. Once trading begins, the Board directs the operation of such stations and is responsible for all costs attributable to generation.

MAP I

THE GRID SYSTEM


BOUNDARIES OF AREAS
132 KV TRANSMISSION LINES
SECONDARY TRANSMISSION LINES
LINES NOT OWNED BY C. E. B.
GENERATING STATIONS - SELECTED
GENERATING STATIONS - TEMPORARY ARRANGEMENTS
PRIMARY AND SECONDARY TRANSFORMING AND SWITCHING STATIONS
HYDRO-ELECTRIC STATIONS
SCHEME AREAS
1 CENTRAL SCOTLAND
2 SOUTH SCOTLAND
3 NORTH EAST ENGLAND
4 N. W. ENGLAND & N. WALES
5 MID-EAST ENGLAND
6 CENTRAL ENGLAND
7 EAST ENGLAND
8 SOUTH EAST ENGLAND
9 S. W. ENGLAND & S. WALES

Adapted from C. E. B., 5th *Annual Report*, December, 1932.

vanish in intricate intercompany transactions. Generation and transmission are divorced from distribution, and private enterprise is restricted to the latter. Private property but *not* private control is suffered in generation, although under limitations of return amounting to use at cost. The grid is both owned and operated by a public corporation. Free private management is restricted to the field of distribution under circumstances (accurately determined cost of energy in bulk at the point of supply[5]) which permit an enlightened scrutiny of its activities. This particular compromise between public and private ownership and management is what is meant by "the British plan." The object of this paper is to evaluate the potentialities of this plan in the light of difficulties presented by its operation.

It should be mentioned at the outset that this experiment should be viewed as more than an attempt to increase efficiency in a single industry. Great Britain cannot hope to retain her position as a world economic power against the competition of nations richer in natural resources without increasing efficiency to a maximum. Rationalization of electricity supply is being looked upon as a primary step toward a reorganization of manufacturing, agriculture, housing, and even transport, on the basis of a cheap and abundant supply of power available on a national scale. Broadly speaking, then, the scheme is one phase of a wider experiment in social planning which is a bid for greater prosperity and a more stable economy. The fullest success of the program may be expected to influence, at the same time that it will reflect, intelligent planning and reorganization in these other fields.

No proper appreciation of the difficulties that hinder the successful operation of the British plan can be gained unless some essential aspects of the British situation are borne in mind. This study will be presented therefore in four sections: the background of the rationalization of electricity supply in Great Britain, the construction of the grid, commercial trading under the British plan, and a general appraisal of the plan. The object of the first two sections is not to give a complete history but merely to place before the reader the most important factors which throw into proper relief the forces affecting the future of the plan.[6]

[5] "Point of supply" is naturally a variable depending upon whether we are considering the owner of a selected station who is taking his supply from that station at adjusted station costs of production, a similar owner whose energy is imported from the grid, or a distributor taking a supply from a grid substation at the end of a transmission line. At this stage of our discussion it is only necessary to point out that "the supply will be delivered at any point at which any service apparatus of the Board is installed and at any pressure which is available at the terminals of that apparatus or at any other point or at any other pressure at which the outlay incurred by the Board in providing the main transmission lines required for affording the supply will not, having regard to the supply required, entail unreasonable expense on the Board." If the expense appears "unreasonable", the supply may still be given on the payment of a suitable annual sum in addition to the general tariff (schedule of rates) applicable to all distributors throughout that scheme area (C. E. B., *Tariff for the Mid-East England Area*, General Conditions for the Supply of Electricity at the Tariff, p. 2. These conditions are standardized for all scheme areas). Consequently, the pressure of the supply varies among distributors. With the exception of *unreasonable* costs noted above, the actual rate for energy to a given distributor does not reflect the voltage of his supply or the distance of the point of supply from the generating station. These costs of transmission and transformation are averaged over each area and, together with C. E. B. expenses attributable to that area, are charged as a flat amount per kw. hr. supplied in the rate schedule for the area. This problem will be discussed in greater detail in the section on "Commercial Trading under the British Plan."

[6] The reader seeking a more detailed description, than is presented here, of the Electricity (Supply) Act of 1926 and how it affects the C. E. B., the Electricity

(*Footnote 6 continued on page 258*)

I. The Background of Rationalization

A. The Situation in the Electricity Supply Industry prior to 1919

The Great War, and the concomitant demand for cheap energy to produce munitions, emphasized the chaotic state of the British electric industry. The Board of Trade's[7] *Circular* in 1916, urging suppliers of electricity to minimize energy costs and the consumption of coal by linking up their systems, proved futile. Later investigations revealed the reason. Greater London may be taken as fairly typical. Seventy undertakings[8] were supplying this area from 70 different generating stations using 50 different types of systems, 10 different frequencies, and 24 different voltages. Of the seven electric railway and tramway systems serving the Metropolis, one operated at a frequency of 50 cycles, two at 33⅓, and four at 25.[9] Throughout Great Britain, excluding all private plants, 422 undertakings generated electricity for public supply in 1918.

It would be unfair to attribute this state of affairs wholly to private enterprise, for normal development of electricity supply had been hobbled by the political power of the municipalities.[10] Whether dominated by the conviction that public service should be in public hands or the less righteous motive that municipal gas investments should be protected, once the possibilities of successful operation had been shown by private enterprise, many municipalities acquired exclusive distribution rights within their city boundaries.[11] Further, they forced insertions, into orders authorizing company distributors, which reserved to the local authority the right to purchase that part of the company's system situated in its political limits at the end of 21 years after parliamentary

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(Footnote 6 continued from page 257)

Commissioners, and the companies and municipalities distributing electricity in Great Britain, is referred to Orren C. Hormell, "Electricity in Great Britain—A Study in Administration", 17 *National Municipal Review* (Supplement) 363-85 (June, 1928); and "Ownership and Regulation of Electric Utilities in Great Britain", 159 *Annals of the American Academy of Political and Social Science* 128-39 (January, 1932).

[7] Prior to the Electricity (Supply) Act, 1919 (9 & 10 Geo. 5, Ch. 100), the Board of Trade constituted the regulatory body for the electricity supply industry under the various electric lighting acts.

[8] Two main types of public bodies are authorized to generate and distribute electricity in Great Britain: "local authorities" and "company undertakers." Local authorities, although chiefly the municipalities, may be either boroughs or urban district councils or rural district councils in England and Wales; either town councils or county councils in Scotland. These political entities may be constituted statutory authorities for the distribution of electricity by orders, issued by the regulatory body and confirmed by Parliament, which prescribe the areas of supply and the conditions under which the supply must be given.

Private supply undertakings (companies) receive their statutory authority to generate and distribute in much the same way although they are subject to somewhat different conditions and usually have somewhat larger areas. The order may be likened to the charter granted American utilities, since it confers privileges within the area, such as practical freedom from direct competition, and imposes certain liabilities —works to be completed within a specified time, maximum charges for energy, etc., together with detailed regulations prescribed in the various Electric Lighting Acts.

The British terms will be adhered to in this article, "supply undertakings" referring generally to authorized distributors whether company or municipal.

[9] *Report of the Committee Appointed by the Board of Trade to Consider the Question of Electric Power Supply, 1918.*

[10] The general fear of company domination of utility services was expressed in the first Electric Lighting Act of 1882 which prohibited any undertaker, authorized to give public supply, from associating himself with any other so authorized. Even the Board of Trade lacked the power to coordinate development of facilities upon a technical basis. (Electric Lighting Act, 1882 (45 & 46 Vict., Ch. 56), §§ 3, 11, 27; and Electric Lighting (Clauses) Act, 1899 (51 & 52 Vict., Ch. 12), Schedule, § 3.)

[11] By the end of 1900, out of 518 Provisional Orders confirmed and in operation, 354 were held by local authorities. With very few exceptions, e. g. London, Newcastle-upon-Tyne, Preston, Bournemouth, Northampton, the *larger towns*, especially in the industrial areas, had their own electricity departments. (Electricity Commissioners, *1st Annual Report*, 1920-21.)

confirmation of the order, and every seven years thereafter.[12]

By the turn of the century, improvements in generation and transmission foreshadowed a power era economically inconsistent with the isolationist policy fostered by these early moves toward municipal operation. Parliament recognized the inadequacy of the existing system by legislation which set up a new type of authorized undertaking, the "power" company.[13] Again the municipalities pushed provisions into the Act which largely vitiated its object. The bigger cities were excluded from power company areas, and the latter were forbidden to supply any person in an authorized distributor's area without that distributor's consent. Although consent was not to be unreasonably withheld, in practice it was not given. Appeal to the Board of Trade was not effective, for each potential customer entailed a separate appeal. One consumer might thus be forced to bear the entire capital charges on a long main extension. Where cost was not prohibitive, time might easily prove so, for no line could be laid until *after* the consent was received. Power companies were consequently restricted to the sparser areas and development of bulk supplies languished under the jealousy and prejudice of municipalities which were more ready to extend inefficient stations than become dependent upon a company.[14] By the time of the War it was clear that this legislation had completely missed fire.

Thus, while private enterprise in the United States was gradually absorbing isolated plants into more efficient systems based upon the central station, the British electric supply industry was stagnating. The British prejudice for municipal ownership of public utilities not only sequestered the choice areas of electric development but also blocked the evolution of more efficient operating systems by private enterprise, first through provisions for the purchase of company properties by local authorities, and second through impediments to the development of bulk supplies by power companies. By 1918 the necessity for new legislation had been urged by three important commissions after analyses of the existing situation.[15] Their recommendations provided the basis for the Electricity (Supply) Act, 1919.[16]

B. The First Attempt at Rationalization

The Act of 1919 was merely a remnant of the bill[17] sent to the House of

[12] This period proved too short to provide adequate inducement for private capital and was subsequently extended to 42 years with recurring rights to purchase every 10 years. (Electric Lighting Act, 1888, 51 & 52 Vict., Ch. 12, § 2.)

[13] This legislation (1900) was sponsored by a Joint Select Committee of Parliament, chairmanned by Viscount Cross. The "power" company is distinguished from the ordinary company in that it is given the right, in *perpetuity*, to supply power in bulk to authorized distributors. Its area of supply is wide and it may supply other than authorized distributors only so long as no more than a determined percentage of the total requirements are for lighting. It is therefore to be distinguished from private authorized undertakers who have general distribution powers. (Electricity Commissioners, *1st Annual Report*, 1920-21.)

[14] Halifax and Huddersfield provide one of many possible illustrations of this characteristic attitude. These municipalities in 1925-27 constructed an underground interconnector between their stations at a cost of approximately £100,000 rather than take a supply from the Yorkshire Power Co. which had a line through the center of their territories and was able and willing to meet their requirements at a price below their costs. (A direct translation of British monetary values into dollars is rendered difficult by fluctuating exchanges before 1925 and after 1931. An approximation is possible by using the old par, $4.86 to £1.)

[15] The Electrical Trades Committee (1917), the Coal Conservation Committee of which a small subcommittee under Viscount Haldane devoted its attention to electric power, and the Electric Power Supply Committee of which Sir A. Williamson was the chairman (1918).

[16] 9 & 10 Geo. 5, Ch. 100.

[17] There it was proposed that the Electricity Commissioners, after investigation, should carve out as many

(*Footnote 17 continued on page 260*)

Lords by the Commons, but it was a long step toward ultimate rationalization of the industry. It transferred to the newly constituted Minister of Transport all powers and duties relative to electricity supply formerly exercised by the Board of Trade, and provided for a body of Electricity Commissioners (not exceeding five in number) which was to be appointed by, and responsible only to, him. The Commissioners are a body of technical experts. They constitute the regulating commission for all authorized undertakers as well as a planning body for the industry as a whole. Although the compulsory provisions of the original bill were deleted, the Commissioners were still in a position to effect a measure of reorganization.

As a regulating commission, among other powers, they sanction all borrowing by local authorities under electricity supply legislation, approve areas of supply, and control the establishment of new or the extension of old generating stations and transmission lines, and the making of bulk supply agreements. They have qualified power to require alterations in the type of current, frequency or pressure employed by authorized undertakers, and may require accounts, statistics, and returns from these undertakers. With the power to make special orders regarding any matters arising under the electricity acts, they could bring great pressure, official and unofficial, to bear upon the electric utilities. In their capacity as a planning body, it was their duty to approve or formulate, after hearings, schemes for improving the existing organization of the industry, to determine the most economical regional division of the country into electricity districts, and to make orders, embodying such approved schemes, to provide for the formation of Joint Electricity Authorities.[18]

Convinced that they sensed a genuine interest in reorganization, the Commissioners set about an analysis of potential electricity districts. In their first annual report they had provisionally delimited 13. But practical application of their program was discouraging. Ingrained parochialism could not be washed away by act of Parliament, and engineering judgment had to be sacrificed repeatedly

(*Footnote 17 continued from page 259*)

regional areas in Great Britain as *technical considerations* should require and that the ownership and operation of all public generating stations and main transmission lines should thereafter be vested in District Electricity Boards. These public corporations were to be financed by electricity stock issued by the Treasury. Actual cost less depreciation was to be paid in cash to companies and in terminable annuities to local authorities. All powers of purchase of company undertakings by local authorities were to be abrogated unless specifically approved by the Commissioners. The latter were to be empowered to order any undertaker to give a supply to any customer upon reasonable terms and, upon failure of compliance, to order the transfer of the undertaking to the District Electricity Board or permit the latter to supply directly for power purposes in the undertaking's area. Such a proposal for compulsory concentration of almost complete control of the industry in the hands of public corporations, supervised by a single commission, inevitably ran afoul of strong vested interests in both Houses of Parliament. Proponents of the bill accepted a compromise which eliminated its compulsory features rather than see it held up until a later session. When these features were re-introduced in the following year, the resultant controversy forced withdrawal of the bill.

[18] The Joint Electricity Authority (J. E. A.) was Parliament's compromise with the District Electricity Boards proposed in the bill. Unlike the latter, the J. E. A. may be constituted only upon the *voluntary* agreement of the undertakers concerned. Once constituted, it owns and operates, on a no-profit basis, the generating stations and main transmission lines in its area; but its authority does not extend to the distribution policies of its constituents. As an independent authority, subject to control by a board established to give definite representation to undertakers and major consumers in its area, it has powers to borrow, issue stock or bonds, and make other financial arrangements. These financial powers were granted in the Electricity (Supply) Act, 1922 (12 & 13 Geo. 5, Ch. 46). As an authorized undertaker, the J. E. A. may be given *distribution* rights within any unoccupied area for which its application is approved by the Electricity Commissioners. The West Midlands J. E. A. has such a distribution area.

to selfish interests of particular undertakers seeking to absorb an undue share of the expected economies. Most undertakers refused to transfer their generating stations to a J. E. A. and maintained their right to extend up to the capacity of their sites, whether or not these were adapted to modern generating methods. The Commissioners were finally forced to admit that "—they have found themselves unable to secure a thorough reorganization of the supply of electricity in any district on the lines contemplated by the Act of 1919."[19]

The failure of voluntary cooperation was so patent that even the accession of a Conservative Government in the fall of 1924 could not stay the movement for further legislation. A committee under the leadership of Lord Weir assisted by the Chairman of the Electricity Commissioners, Sir John Snell, was appointed. Its able report was the basis of the Electricity (Supply) Act, 1926.[20]

C. The Electricity (Supply) Act, 1926

Briefly, the Central Electricity Board (C. E. B.)—a chairman and seven other members appointed by the Minister of Transport for terms of five to 10 years subject to reappointment—was set up as a non-political public corporation and an authorized undertaker.[21] As a public corporation it is authorized to borrow money or to issue non-voting electricity stock[22], which may be guaranteed both as to principal and interest by the Treasury. It is responsible to the courts rather than to a government department. As an authorized undertaker it is subject to the supervision of the Electricity Commissioners. Whereas the Commissioners remain the supervising, regulating and planning body, the Board is the operating body. The Commissioners prepare a technical scheme for a given area, determining what generating stations should be selected, what transmission lines should be constructed or purchased, what standardization of frequency should be required, and what temporary arrangements with undertakers, or other provisions, should be made during the period which must elapse before the grid can be brought into operation.

[19] Electricity Commissioners, *4th Annual Report*, 1923-24, p. 16. Out of 15 electricity districts delimited to March, 1924, no scheme was submitted in one and the project was dropped after public inquiry in two others. Of the remaining, only four had been finally approved by Parliament and only one of these provided for a J. E. A. This last (the North Wales and South Cheshire Electricity District) immediately transferred its powers of supply by deed to the North Wales Power Company, Ltd. In fact, up to the last of December, 1925, only three out of the eight electricity districts finally established provided for J. E. A's, the others being satisfied with purely advisory boards. Of the other two J. E. A's, one (the London and Home Counties Electricity District (July 29, 1925)) never actually operated on its own until it came into operation largely in conjunction with the C. E. B.; and only the last (the West Midlands Electricity District (December 21, 1925)) can be characterized as the type of authority contemplated in the Act. Professor Hormell in his article "Electricity in Great Britain—A Study in Administration", *op. cit.*, p. 374 erroneously includes the Edinburgh District instead of the West Midlands as a J. E. A. set up under the 1919 Act. This article gives an excellent picture of the conditions leading up to the 1926 Act.

[20] 16 & 17 Geo. 5, Ch. 51.

[21] One must distinguish between the *members* of the Board whose position is akin to that of a board of directors of a corporation and the *staff* of the C. E. B. No member of the Board can be a member of Parliament and, if appointed on a full-time basis, he can have no financial interest in any company supplying or generating electricity or manufacturing or selling electrical machinery or plant for generation or transmission. This restriction does not apply to the staff of the C. E. B. and, in fact, the only full-time member, to whom it is applicable, is the Chairman. Part-time members can take no part in deliberations or decisions upon proposed contracts with those companies in which they have a financial interest. The officers of the C. E. B., with the exception of the Chairman, are not members of the Board.

[22] Electricity stock is equivalent to our income bonds. It is issued at a fixed interest rate on the general earnings of the C. E. B. without mortgage or foreclosure rights.

The Board, after public inquiry, may adopt the scheme with such modifications as it sees fit, always providing that aggrieved undertakers may appeal for relief to arbitration and receive either pecuniary compensation or, if the Board is willing, some modification in the scheme. Any scheme adopted may be so revised provided that no selected generating station be de-selected without consent of the owners.

Once a scheme has been adopted, the C. E. B. must provide for the construction of the transmission lines and equipment necessary to the operation of the scheme area as a power zone within which the generation and transmission of electricity may be completely coördinated. While construction is in progress, it may make temporary arrangements for the purchase and sale of energy to authorized distributors on any terms that may be agreed, but it can exercise no mandatory control. When ready to operate, it must publish a schedule of rates (approved by the Commissioners) at which it is ready to sell energy to any authorized undertaker within the area, and give formal notice to all selected station owners. From the date of this notice, the C. E. B. becomes responsible for all capital and overhead costs at selected stations (whether used for generation or not) as well as all operating expenses, but it may exercise complete control over their operation.[23] It cannot own or operate generating stations unless it is unable to get any authorized undertaker to do so on reasonable terms; and it cannot sell electricity to any company or person other than an authorized undertaker. It has no distribution powers and no jurisdiction over the affairs of authorized distributors. In other words, the C. E. B. is incorporated to deal in bulk supplies. It directs the operation of generating stations connected to the grid, buys all energy produced at such stations, and resells in bulk to authorized undertakers at practically cost price. Although each scheme area is planned as a unit, all are connected through the grid, and it is expected that they will be operated eventually as one national system with a single schedule of rates for the whole of Great Britain.

II. The Construction Phase of the National Grid

The plan of rationalization legalized in the Act of 1926 is now virtually complete, from a physical point of view, for all of Great Britain. There are two exceptions: no scheme has been adopted for North Scotland, and operation in three other areas must await standardization of frequency. A scheme for North Scotland, an area comprising 23.3% of Great Britain but holding only 1.8% of the total population, was partially prepared by the Electricity Commissioners. The region has an average density of only 40 persons per square mile; Scotland is suffering from acute depression; and some electrical development in the area was assured by an application for rights to distribute over much of the Highlands. Although the Commissioners were convinced that a scheme would prove economical, it was deferred until a more normal period.[24] Change of frequency operations[25] in North East England, Central

[23] The period of "trading" begins with the promulgation of the grid tariff (schedule of rates) and the notice to selected station owners.

[24] Electricity Commissioners, *12th Annual Report*, 1931-32, p. 15.

[25] The standardization of frequency (at three-phase 50 cycle A. C.) throughout the country was a necessary condition to the efficient operation of the superpower network called the grid. Technical details are irrelevant here. Suffice it to say that change of frequency

(Footnote 25 continued on page 263)

England, and South West England and South Wales are of such magnitude that final completion is not expected until 1936 in the first named district and 1935 in the other two. With these qualifications, construction may be said to have ended in the fall of 1933, just six years after the first work was undertaken.

It is not the object of this paper to evaluate the grid from an engineering point of view. But a brief discussion of certain important technological, economic, and financial considerations which influenced the C. E. B. during construction will be of value in an appraisal of the British scheme as a whole.

A. Technological Considerations

Contrary to American experience—the gradual evolution of a superpower system upon a pay-as-you-go basis—the national grid was superimposed upon the British electricity supply industry within the brief space of six years, and at a cost which would not permit profitable operation for a period estimated at 10 years. The question naturally arises, Would it have been more economical to bring the grid into operation piecemeal?

In a sense the grid lines were brought into operation by degrees. To forestall extensions of isolated generating plants which would prove unnecessary once the grid was ready to function as a whole, construction of the lines was pushed, and temporary arrangements were negotiated under which the C. E. B. bought and sold energy at agreed prices. Energy was usually purchased at advantageous off-peak terms and resold to other undertakers at a price determined by estimated cost of production to the purchaser were his plant extended, or, at a price fixed to enable him to retain a large industrial load or develop an agricultural area. The object of such agreements was not the economical utilization of grid lines but the curtailment of plant extensions. Some, therefore, resulted in temporary loss to the Board. In such negotiations the Board was often at a disadvantage for it had no mandatory powers over undertakers, and those anxious to expand plant proved difficult taskmasters. Demands for several temporary sources of supply (at least two were to be provided each undertaker under the completed scheme) undoubtedly enhanced the cost of construction. Costly connections, doomed for early scrapping, often augmented the cost of permanent work by congesting the substation site with temporary apparatus. Lack of time for proper testing and cost-plus terms on hurried work opened the door to inefficiency and made it difficult to hold either contractors or consulting engineers to established specifications.[26] This situation was not of the Board's making. Corrective action too long delayed in a dynamic industry becomes expensive. More time might have saved expenditure upon construction but at

(*Footnote 25 continued from page 262*)

operations are actually carried out by the authorized undertakers involved, although they are financed by the C. E. B. through the issue of electricity stock. Funds earmarked for frequency change are administered in trust by the Board. Interest and sinking fund on this capital are paid by the Commissioners, who levy upon all authorized undertakers (in the same way that they recoup their own expenses) in proportion to revenue received from the sale of electricity excluding bulk sales to other authorized undertakers. The cost of frequency change thus falls upon the whole electric utility industry irrespective of whether a given undertaker has required standardization or is even on the grid.

[26] I am unable to hazard an estimate of increase in cost resulting from such factors. The opinion expressed here is based upon an exhaustive study of negotiations in 45 temporary arrangements, discussion with engineers of the Board and the undertakers, and actual examination of many such connections.

the cost of competitive overbuilding of uneconomic generating stations.[27]

This was not true piecemeal operation, for the Board did not operate its lines on a trading basis.[28] In fact, those who hold a brief for piecemeal operation are fundamentally opposed to a superpower system for Great Britain. This is a problem too broad to be considered here. The answer to dissenters must be found in the disorganized state of the electric industry, its low average generating efficiency, its lack of progressive development, the high cost of unstandardized appliances versus the economies of base loading, interconnection, and standardization of apparatus and frequency.[29] Some ground their objections on the assumption that mercury-arc rectifiers will eventually render costly frequency change unnecessary and provide a cheap method of transmission at high voltage direct current. The future may hold such improvements in store, but progress cannot be postponed indefinitely while an ideal system is evolving; and the state of development in this field is such that it could not be considered at the time of construction of the grid. In fact, it is not yet practical for voltages beyond 22 kilowatts. If and when it comes, generation will be unaffected and the transmission capacity of the grid lines will be merely tripled without loss.[30] Transformers, of course, will be rendered unnecessary and it is possible to design a system requiring no switchgear; but if switching is necessary on load, switchgear, including circuit-breakers, would still be required.[31] But transformers and switchgear do not last forever.

Since the ultimate object of reorganization was to eliminate the large number of isolated stations, time was a vital factor in the construction program. The utter failure of the 1919 Act, together with an increase in the size of individual turbine and boiler units installed and the desire of undertakers to expand their generating capacity to a maximum, had resulted in an increase of plant installed from the beginning of 1920 to the end of March, 1932 of 5,055,000 kilowatts, or an increase of over 236%. During the same period maximum load rose but 2,321,000 kilowatts, or 142%. Thus spare plant, as a percentage of maximum load recorded, rose from 31.4% to 82.5%.[32] Although there had been "steady progress" in concentrating generating plant in larger stations and improving equipment, the number of generating stations showed a general tendency to increase. In 1920, 532 authorized undertakings owned among them 475 generating stations. Despite the efforts of the Electricity

[27] At the end of 1931, 45 undertakers were being supplied by the Board under temporary agreements. These prevented plant extensions estimated at £2,250,000 (C. E. B., *4th Annual Report*, 1931, p. 7). The Board's Commercial Manager estimated total savings on this account to July, 1933 at some £3,000,000.

[28] As previously explained, this involves a grid tariff and a formal notice to owners of selected stations (see above p. 262). Before an entire scheme area could be brought into operation, it is doubtful if the advantage of control over generating stations would compensate for the capital burden on stations which could not be properly utilized.

[29] Development of domestic electrification was practically precluded in some areas under the old system. The flickering of lights at 25 cycles in Birmingham had forced the municipality to install rotary converters and distribute direct current at a cost prohibitive for extensive development.

[30] This statement requires qualification for, although it can be built at great expense, no efficient and commercially practical lightning arrester has been developed for D. C. transmission. The ideal method of D. C. transmission is by underground cable where lightning troubles are eliminated; but underground cables are expensive and they have not yet been perfected for extra high tension transmission.

[31] This does not mean that *existing* switchgear and circuit breakers could be used without extensive modifications, for the problems in switching and circuit breaking with direct are much more difficult than with alternating current.

[32] Supplied by H. Quigley, Chief Statistician of the C. E. B.

Commissioners, by March, 1927 these figures were 623 and 479 respectively, and by December, 1930, they were 665 and 495.[33] Much of such work would prove not only unnecessary but embarrassing to the Board, once the grid began to operate. It could not be halted, for the sale of electricity was increasing annually by an amount that faltered but did not disappear even during the deepest depression.[34] True piecemeal operation was inconsistent, therefore, with the fundamental objectives of the British scheme.

B. Economic Considerations

The inclusion of two areas—South Scotland and North East England—in the national scheme presents problems which are worthy of attention. Were the South Scotland area considered alone, its inclusion in the scheme might seem unjustified. With an average population density of but a trifle over 58 persons per square mile, a low standard of living, and no important industrial sections, it could not be expected to pay its way for 15 years according to Board calculations. Further, it was not required for the economical operation of the grid in either England or Scotland. True, the area is a source of water power,[35] and such supplies required an outlet. The coming of the grid made possible extensive schemes for development of electrical distribution which would have been delayed many years. The inclusion of South Scotland was rendered certain when the Unemployment Grants Committee declared its willingness to authorize government assistance not only for the development of water power generating stations within the area but also for construction of the grid itself.

Practically the entire North East England area is served directly or through bulk supplies by the North Eastern Electric Supply Co.[36] Except for a few municipal undertakings, the whole region, largely industrial, was standardized at 40 cycles. Even if connected with the grid lines in other districts, this area, containing some of the most efficient stations in Great Britain, already interconnected, was expected to remain largely self-sufficient if not to become an exporter to other areas. Why spend £10,000,000 in changing frequency in such an area? Briefly, the reasons were three, and they were all long-run considerations. (1) Frequency changers for large blocks of power transmitted at 132 kv. were found to be not a prohibitive, but a continuing, expense and a source of potential trouble which would have required excessive stand-by capacity and would have prevented any wide future use of the stations for export purposes. (2) In the course of time, economies in standard 50-cycle apparatus and in base-loading on the grid outside the area would tend to set up differentials which would prejudice the development of North East England were it to remain an island of 40-cycle energy. (3) Were the decision to change postponed, it would

[33] Electricity Commissioners, *7th Annual Report*, 1926-27, pp. 6-8. And *11th Annual Report*, 1930-31, pp. 10-11. These figures do not include the stations belonging to railway, tramway, and non-statutory undertakings. The grand total at the last date was 559 stations.

[34] Electricity Commissioners, *13th Annual Report*, 1932-33, p. 12. By the end of 1932, Great Britain had reached third place in the production of electricity from public supply systems. The total number of public supply generating stations was then 442.

[35] Five existing hydro stations are selected in the area and a sixth is scheduled for construction.

[36] In 1932, out of a total of 793.97 million kw. hrs. generated in the area, this company sold 615.2 million. It served an area of 3,682 square miles and a population (in 1931) of 1,641,936, whereas the totals for all undertakings in the area are only 4,123 and 2,674,260, respectively.

rapidly become so great a financial venture as to be impractical.

In both of these projects the Board received direct government aid from the Unemployment Grants Committee: a grant of interest on expenditure up to £10,000,000 on change of frequency in North East England, and up to £1,000,000 on construction of the grid in South Scotland.[37] Although the C. E. B. officers claim that this did not influence their decision in either case, it introduces a consideration which has played an important role in the construction of the grid as a whole. The entire period of construction was one of unemployment and, in the later years, acute trade depression in Great Britain. Huge expenditures upon the grid and upon change of frequency were justified in Parliament and to the people at large, not only as an investment in future efficiency, but also as an aid to labor and a stimulus to depressed industry. Being a public corporation, the Board could not disregard this implicit duty. Thus it was easier to take a broader view in such cases as those mentioned above, but more difficult to curb unnecessary expense.[38] Foreign bids were entertained but they were not seriously considered.[39] The boast that the grid is the exclusive product of British labor conceals an indeterminate investment in political good will.[40]

C. Financial Considerations

With no revenue account, without Treasury guarantee of principal or interest, the C. E. B. has financed the construction of the grid and the change of frequency, to date, by the issue of £43,000,000 par value, non-voting electricity stock, at an average cost of 5.132%. The lack of a Treasury guarantee has undoubtedly had some effect upon the cost of capital and may have restricted the potential market for securities.[41] But the effect must not be overestimated for by refusing to avail itself of the privilege, its right to such a guarantee upon *stock already issued* is not given up. In case of need it may yet fall back upon the Treasury. Meanwhile, it has preserved its independence from political interference through a government department, and retained complete freedom of action in the negotiation of temporary agreements and other finan-

[37] The details are irrelevant here. Briefly, in the former, 100% of the interest up to December, 1936 and 50% of interest thereafter to the end of the period —15 years in all; in the latter, full interest for five years after commencement of the work (not over 5%) and half interest for five years thereafter (not over 2.5%.)

[38] Security against adverse criticism in the event of a future breakdown required the Board to engage the best consulting engineers available. It had to struggle continuously against the elaborate and costly "exhibition finish" proposed by these consultants.

[39] It is not suggested here that the construction of the grid was primarily advocated or carried through on the principle that public projects should be embarked upon during periods of depression as an aid to recovery. The lack of any economic study of the situation or the course of trade is sufficient proof that construction was envisaged as an engineering problem merely. But it is affirmed that the depressed state of British industry and trade strengthened the natural prejudice which engineers have for special equipment of a type and design with which they are familiar. A study of contract awards substantiates this conclusion.

[40] Sometimes the question of amenities was also a factor, e. g., in the decision to use British steel towers rather than cheaper imported wooden poles on secondary lines in rural areas. The latter would have had to be of the "A" type and even the most fanatical prophet of the electrical age could hardly find them beautiful.

[41] C. E. B. shares have never been placed upon the Parliamentary list of securities eligible for investment of Trustee Funds. This list was drawn up before the Board's shares were on the market and an act of Parliament is required to alter it. This means that municipalities cannot invest in C. E. B. stock although they may buy municipal securities, the difference being that the latter are finally guaranteed by the local rates (taxes). A Treasury guarantee might be expected to remedy this defect.

Professor Hormell was in error when he wrote that "loans issued by the Board are guaranteed by the National Treasury in order to secure a low rate of interest." ("Ownership and Regulation of Electric Utilities in Great Britain", *op. cit.*, p. 136.)

cial arrangements. Only in this way can it in fact, as well as in theory, act as a true representative of the electric supply industry as a whole.

In view of the considerations above, it is no mean achievement that the final cost of the grid, discounting for necessary alterations in the system as compared with the original proposals of the Electricity Commissioners, will exceed the estimates by no more than 2½%.[42]

The two remaining sections of this article on commercial trading under the British plan and general appraisal of the plan will appear in the next issue of the *Journal*.

[42] C. E. B., *5th Annual Report*, p. 5. Total cost will approximate £26,700,000. This does not include the cost of standardization of frequency. The latter, originally estimated by the Weir Committee in 1926 to be not over £10,500,000 gross, is now expected to attain a figure of 19.8 to 20.8 millions. Delay in putting the program into operation, rapid progress in industry and inadequate appreciation of the extent and difficulty of change demanded are responsible for this wide error in estimate.

The total cost of rationalization of electricity supply in Great Britain is therefore understated in the capital cost of the grid alone. Only the latter, however, is a charge on the operations of the C. E. B. The standardization of frequency was too highly concentrated in certain areas to permit the cost to be borne by the undertakings or the areas concerned. Five undertakings alone (two each in Central Scotland and Central England, one in North East England) must incur expenditures estimated by the C. E. B. in June, 1933 to aggregate £17,675,740 out of a total estimate for the country of £19,623,876. The efficient operation of the national scheme required the participation of these undertakings, and the standard frequency was selected because of its advantage to the utilities as a group. Consequently, the cost of frequency change is levied upon undertakers irrespective of changes in their own frequencies.

An Industrial Engineer Looks at Agriculture

By PETER M. STRANG*

AGRICULTURE, as an industry, is composed of many small units which produce a relatively limited number of commodities. For the industry, a comparatively few middlemen collect, sort, and distribute the products. Changes which occur in the requirements for agricultural products are not easily translated to the individual farmer. The individual farmer has neither the means nor the ability to keep abreast of his market as does the automobile manufacturer. The farmer has practically all his capital invested in fixed assets and his working capital is not large. If some condition causes the value of his farm to diminish, some of his capital vanishes and he suffers because his borrowing capacity is reduced. If the prices of agricultural commodities decrease, he is handicapped in meeting his obligations.

The effects upon agriculture of changed conditions, mechanization, and technological improvements are not immediately realized because this industry is decentralized. One change may seemingly be of little consequence to the individual farmer, although the cumulative effect of many changes and developments may be tremendous.

Agriculture cannot be easily revamped to meet changed conditions. A farm can produce only agricultural products, regardless of changes that occur within or without the industry. The agriculturist, however, can change his produce but once a year, after planning far in advance; and, in general, new crops are hard to find. Substitution of crops is frequently impossible since a crop must be adapted to its environment.

It seems a far cry from the installation of individual electric drives on machinery in factories to agriculture. Yet when individual electric drives are installed on machinery, the market for one farm by-product, green hides for the manufacture of leather belting, is adversely affected.

In the textile industry, the gradual substitution of cork-covered spinning rolls for leather-covered rolls is affecting two agricultural products: wool for cloth required to cushion the rolls and the leather for the covering itself. This seems, at first glance, to be a very small item, as each roller requires but two small pieces of wool cloth, of about 4½ square inches, and two small pieces of sheepskin of the same size. When it is realized, however, that three rolls are required for every two spindles, that these rolls have to be recovered with new material at least once a year, and that there are more than 160,000,000 spinning spindles in the world, the quantity of wool and the number of hides required become items of vast significance. It is worthy of note, also, that cork-covered rollers can be used in other machines in a cotton mill. The reduction of a market like this will tend to reduce the price of the materials involved, if their production remains constant, or will require a decrease in production to maintain their price.

Three types of changes affecting agriculture may be cited by way of illustration: one from the leather boot and shoe industry, one from the road-building industry, and one from the automotive industry. Twenty years ago high shoes were in vogue; today low

*Credit is due George L. Crawford, Senior Agricultural Economist, United States Department of Agriculture, for his assistance and criticism in the preparation of this manuscript.

shoes have almost entirely displaced them. Agriculture was affected by this change; it lost the market for all the leather required for shoe uppers and for all the cotton required to line and stitch these uppers. Ten years ago mules were extensively used for hauling on road-construction jobs, and mules with drag pans for removing dirt were a common sight. These work animals furnished a market for farm products, a market which is gone now that road-construction work is done so largely by auto trucks, tractors, and other machinery. On the other hand, 30 years ago there was practically no automotive industry. Today this industry furnishes agriculture a market for large quantities of cotton for tires and tops and of both cotton and wool for upholstery.

In the three cases cited it is difficult to trace the exact effect of changed conditions on agriculture. The effects are there and when added together they must be great. The use of the tractor is, however, one development whose effects on agriculture can be measured to a limited extent. This machine requires for its operation oil and gasoline, both non-agricultural products. The following tabulation presents a rough analysis of how the introduction of tractors has affected the farming industry.

THE EFFECT OF THE TRACTOR ON FARM INDUSTRY

Farm labor	Greater production per man-hour with same labor force to handle the same or an increased amount of land
Markets reduced for farms, farm products, and by-products	Horse farms, mule farms, hay, corn, oats, horses, mules, leather-harness, cotton-harness, horse blankets, cotton linters
Available acreage increased for farm production of cash crops	Hay, corn, oats, wheat, cotton, etc.
Increased need for cash to buy non-agricultural products	Gasoline, oil, fertilizer, repair parts

Surveying agriculture as a basic industry, several rather well defined conclusions can be drawn from this tabulation. The capacity of the individual farmer to produce has been increased, and this has tended toward overproduction. Since the habits of the farmer have not been changed, he has continued to work the same number of hours each day and thus to increase his production rather than maintain his former production through decreased hours of labor. If the individual farmer has reduced his hours of work, such reduction has probably been caused by the limited size of his farm. The market for farms and farm products has been reduced. Available acreage for cash crops has been increased and this in turn tends toward overproduction and reduced prices. The effect appears to be much the same whether it results from overproduction or from reduced demand with customary production. Meanwhile, the need for available cash with which to buy supplies is imperative, causing the farmer to strive harder to produce more in order to get this needed cash.

The farmer may have been able to reduce his labor force. The reduction of his labor force would, of course, tend to increase the supply of farm labor. On the other hand, if the farm hands released drift to the cities, they tend to increase the urban supply of labor. Some of the labor released from farm work may be used to build the machines used on farms. There is always the added thought that an experienced farm hand may be but an inexperienced machinist.

The tractor has also aided in increasing the size of the unit of operation per man. The number of acres of crop land harvested on the average farm in the United States in 1909 was 50 acres; in

1919, 56 acres; and in 1929, 58 acres.[1] This would indicate that the average acreage harvested per farm in the United States has increased about eight acres during the past 20 years. Of course, other influences, such as improved horse-drawn farm machinery, have contributed to this trend, but probably the largest factors have been the rapid rise of the tractor and the bringing under cultivation of the level lands in the West. The greatest expansion of cotton acreage has taken place on the western plains of Texas and Oklahoma where the land is suitable for tractor farming. This principle holds true with respect to wheat, the greatest expansion having taken place in the central and northern Great Plains where the land is suitable for tractor operation.

When the tractor came to the farm, it assumed a different role from that performed by the stationary engine. It displaced the horse and brought about a general reorganization of farming. In discussing this movement, it is not proposed to deal with the farm as a unit, but with farms as a producing aggregate.

In 1900 there were practically no motor vehicles in the United States. According to the census report, in 1920 there were 2,531,614 motor vehicles, including tractors, on farms in the United States, and by 1930 this number had increased to 5,955,081. These figures show the tremendous expansion during these 30 years. The number of horses and mules on the farms of the United States in 1900 was about 21½ million; 24½ million in 1910; 25½ million in 1920; and 18.8 million in 1930.[2] From 1900 to 1918 there was a gradual increase in the number of horses and mules on farms in the United States, as well as a more rapid increase in motor vehicles. These figures indicate that motor vehicles were supplementing horse power on the farm, the increase of both types of power being attributable to the expansion of population in the United States and to the increase of foreign exports between 1913 and 1921.[3] However, during the years between 1920 and 1930, the number of horses and mules on farms not only did not increase but actually decreased more than 6,000,000. During the same period, the number of motor vehicles increased by more than 3,400,000. This indicates clearly that at least 6,000,000 horses and mules had been replaced on American farms by 3,400,000 motor vehicles.

According to reliable authorities, the average horse weighing about 1,350 pounds will consume 3,000 pounds of grain and about 5,000 pounds of hay annually. By multiplying 3,000 pounds by 6,000,000 we have 18,000,000,000 pounds, the quantity of grain which would have been consumed by horses on the farms of the United States had the tractor not replaced them. By multiplying 5,000 pounds, the amount of hay consumed by one horse annually, by 6,000,000, we have 30,000,000,000 pounds as the quantity of hay required, or 15,000,000 tons. This hay, like the grain, is no longer consumed on the American farm because of the replacement of the horse by the motor vehicle. One could add to the decrease in horses on the farm the decrease in horses in the city—possibly another million and a half—these animals likewise having been replaced by motor vehicles. The market

[1] O. E. Baker, Bureau of Agricultural Economics, United States Department of Agriculture.

[2] *Statistical Abstract of the United States*, 1931, p. 677.

[3] O. E. Baker, "The Outlook of Land Utilization in the United States," United States Department of Agriculture publication, July, 1931, p. 23.

for grain and hay, both of which are farm products, has been irretrievably decreased; and the market for the non-agricultural products, gasoline and oil, has been increased. In passing it is interesting to note that Dr. O. E. Baker of the United States Department of Agriculture estimates that 25 million acres of crops have been released in America since the war as a result of the substitution of tractors for horses and mules. This is about 60% of the average acreage required to produce the net exports of farm products from 1919 to 1931 inclusive.

Experience shows that the farmer tends to increase his cash crop when he replaces the horse with the tractor. For instance, in the South, cotton acreage is increased when the tractor is introduced; and in the West, corn and wheat acreage is increased. The farmer must have cash to buy gasoline and oil for his tractor. He also requires cash to buy fertilizer which was formerly produced by his animals. The necessity to have money encourages specialization, which in turn makes the farmer depend more on selling his farm crops in order to purchase other commodities.

The effects of crop specialization may possibly be somewhat determined with reference to cotton. In the 10 cotton-growing states (North Carolina, South Carolina, Georgia, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas) the number of horses and mules on the farm has been reduced during the 10-year period 1920-1930. The total decrease in horses and mules in these states has been estimated at 902,000. It has been stated that about 2½ acres of fertile corn belt land are required to feed a work animal for one year. In the South it would probably take three acres or more, as the land is not so well adapted to the production of grain and hay. Three times 902,000 gives 2,706,000, the number of acres which would thus be released from the production of feed crops in the 10 principal cotton states. Multiplying 154, the average number of pounds of lint cotton produced per acre, by 2,706,000 gives 416,700,000 pounds as the approximate quantity of cotton that could be produced on the land previously required to produce feed for work animals. By reducing this lint cotton to 500-pound bales, each having 478 pounds of lint, one would have 871,000 bales. By applying this same reasoning to other states which produce cotton, such as Florida, New Mexico, Arizona, and California, the figure would reach more than a million bales. Data are not available showing the quantity of feed imported into these states for farm work animals, but it is not believed that allowance for importation of feeds from other states would materially alter the estimate shown.

In an address delivered before the American Statistical Association in New York City, April 20, 1928, L. H. Bean of the Bureau of Agricultural Economics, United States Department of Agriculture, said in part, "On the average, given a world supply of American cotton of 20,000,000 bales, an increase or decrease of 1,000,000 bales in this supply has caused a decrease or increase respectively of about 1½ cents in price." Cotton growers of the South have long appreciated that a small crop of cotton brings a greater total price than a large crop, other things being equal. The same situation exists in the case of other important cash crops, such as wheat and corn. In some other industries a very small percentage change in production might have caused considerable change in the prosperity of those industries. In fact, in 1930, Mr.

Floyd Jefferson, a well-known textile merchant of New York City, stated that the excess of production of cotton textiles over shipments amounting to only 1.7% over a period of 3½ years had caused a severe depression in the textile industry. The quantities of raw cotton involved in the preceding paragraph, however, amount to about 7.6% of the total average annual production for the last 10 years.

By application of similar reasoning to Kansas and North Dakota, two typical wheat states, the following results are obtained. During the 10-year period between 1920 and 1930, the number of horses and mules on farms had been reduced 704,000. Multiplying this figure by 2½, the acres required to feed a work animal for 12 months, yields 1,760,000, the number of acres released. Assuming that the average production of wheat per acre is 14 bushels[4] and multiplying 1,760,000 by 14 gives 24,640,000 bushels of wheat, the amount which can be raised on the acres released from producing feed for horses and mules. This is equivalent to about 3% of the average production of wheat in the United States. Many other states grow wheat in large quantities, but these figures are sufficient to illustrate the point.

The introduction of the tractor seems to have accentuated the difficulties of the farmers in the Middle West. Most of their crops are used for either human or animal food and their plans for farm management usually call for the rotation of one such crop with another. People and animals cannot eat unlimited amounts and it has been indicated that the market for animal food has been materially decreased. An example of increased competition among different agricultural commodities tending toward price demoralization is indicated here. In the Corn Belt, for instance, a farmer is likely to have a larger quantity of corn for sale than formerly. Corn is marketed in part as a hog feed. Cheap hog feed causes increased production of hogs. Lard, being an important by-product of the hog, is likewise increased. Since lard is for human consumption and the population is comparatively stable, it is seen that the middle western farmer is here increasing his own competition.

In the South, it has been estimated that, on the tillable land formerly used for the production of horse feed in 10 cotton-growing states, 871,000 bales of cotton could be grown. Assuming that the gin turnout for this cotton was 40% lint and 60% cotton seed, there would also be an increased production of 624,000,000 pounds or 312,000 tons of cotton seed of which about 10% would be required for replanting. Cotton seed is manufactured into cotton seed oil and animal feed. The increased production of cotton has caused the mid-western farmer more competition in both of his main markets because cotton seed oil competes with lard for human needs and cotton seed products compete with his already overburdened market for animal feed.

If export demand for these cash crops were increasing, no difficulty would arise because of shifts in crops. But this is not the case. In 1930 three countries of Europe—England, France, and Germany—showed a decrease of 362,000 horses from the number in use in 1926.[5] This is indicative of what has happened in many parts of the world. The grain

[4] The average yield per acre during the 10-year period 1921-1930 was 14.2 bushels when computed from figures published in the United States Department of Agriculture *Yearbooks*.

[5] 1932 United States Department of Agriculture *Yearbook*, p. 820.

used on European farms to feed these animals has been released for other purposes, thereby reducing the demand for the importation of grain, a large percentage of which came from America. The Orient is often mentioned as a great potential market for agricultural commodities but probably decades will be required to develop this market.

Some have believed that the reduction in acreage under cultivation which has occurred in the last decade, together with the increased population of the country, has offset to a large extent any reduced market for agricultural products resulting from changed conditions. This theory is not confirmed when a rough analysis is made showing the acreage cultivated per inhabitant in 1919 and 1929, after making allowances for the net acreage required to produce exports and the acreage required to maintain horses and mules in each of these years (Table I).

The fact that the acreage cultivated per inhabitant was the same in 1929 as it was in 1919 indicates overcapacity to produce, especially when it is remembered that farm animals which produce human food are more efficient than formerly per unit of feed; farm methods have been improving and have caused more land to be double cropped; acre yields of crops are in most cases remaining the same; and improvements, such as cold storage and better transportation, have tended to reduce the productive capacity required per unit of population. The theory is sometimes expounded that human wants have increased to such an extent as to furnish additional markets for agricultural products. It should be borne in mind, however, that human wants do not necessarily increase in the same proportion or in the same direction as does the capacity to produce goods for satisfying these wants.

TABLE I. ACREAGE CULTIVATED PER INHABITANT, UNITED STATES, 1919 AND 1929

Item	Acres in 1919 (Millions)	Acres in 1929 (Millions)
Total crops,* harvested acres	372	369
Less net acreage to produce exports	49	31
Less acreage to maintain horses and mules (3 acres allowed per animal)		
26.3 million animals in 1919	79	
19.7 million animals in 1929		59
Total deductions	128	90
Acreage cultivated for population	244	289
Population in millions (Census figures)	105	121.5
Acreage cultivated per inhabitant	2.3	2.3

*Figures for crops harvested by Dr. O. E. Baker, United States Department of Agriculture.

The disastrous effects of overcapacity to produce have been demonstrated in the sugar,[6] the cotton textile, and many other industries. The curbing of overcapacity[7] is considered the main factor in salvaging the cotton textile industry.

Should this displacement of the horse by the tractor continue, even at a much less rapid rate than between 1920 and 1931, the problem will become of even greater importance than it is today. This displacement of the horse on the farm by the tractor has been given a prominent part in this discussion because its results are obvious and are measurable to a certain degree. There are no complicated offsets in this case, as when one agricultural commodity displaces another agricultural commodity. Tractors furnish practically no

[6] "Some Present-Day Problems in Distribution," Dr. M. T. Copeland, Harvard Business School, December 6, 1930.

[7] Report of address by B. B. Gossett before the United States Chamber of Commerce Convention in Washington, D. C. by *American Wool and Cotton Reporter*, May 10, 1934, p. 29.

new market for American farm products. Tractors require very little upholstery and their tires are usually of metal or solid rubber. However, if the farmer should revert to the use of the horse for power to pull his farm implements, this reversion would not necessarily bring agriculture to a prosperous state.

Not only has overcapacity to produce arisen to affect both the prices of farms and the prices of farm products but other changes have taken place which have reduced the farmers' sources of revenue. For example, oil burners have cut the market for firewood in some sections of the country. Before the development of automobiles and new roads, when the railroads were the main source of transportation for the country, the farmers received an intangible rebate on their freight through the taxes paid by railroads. Today, new roads afford a second independent means of transportation and the costs for the upkeep of these roads have more than eliminated this rebate. Formerly, in some parts of the country, the farmer could work out part of his taxes on the roads. Today this source of income is gone because roads are cared for by permanent maintenance crews.

Specialization of production has also cut into farm incomes. When the farmer sells farm products, he usually receives a wholesale or farm price. When he buys products for use on the farm, he pays the retail price, which is the wholesale price plus the costs of transportation and distribution and the profits for the retailer. In addition, he transports the product from the station to the farm. Whenever a farmer can use something he grows, he really sells to himself at a wholesale or farm price and saves for himself all retail and handling charges. When it is necessary for him to sell his crops at a farm or wholesale price in order to buy gasoline, oil, and other supplies at retail prices, his net income may be reduced.

Farmers have also to contend with the fact that interchanges sometimes take place in the consumption of farm products. An illustration of such an interchange may be seen in the dietary developments which have occurred since the World War.

The growth of "hand to mouth" buying as a business practice is another change whose effect on agriculture is not generally known.

Any plan for permanent agricultural relief must show a way of digesting the great developments in technology of the past two decades. The few citations made concerning changed conditions and markets for agricultural products or by-products merely scratch the surface. Many other fundamental developments, such as the manufacture of artificial fibers, style changes, the introduction of cold storage, better transportation, improved methods of preserving perishables, and more economic merchandising of products, have tended to reduce the farm capacity required to care for a given population.

I. The Local Transportation Problem in the District of Columbia

By CHARLES F. MARSH

CITIZENS of the District of Columbia hailed the unification of the various traction and bus lines in the District into the Capital Transit Company on December 1, 1933 as a vital step toward securing a "new deal" in local transportation. They looked upon the merger as the beginning of the end of an era characterized by poor service, high rates, low return upon invested capital, and acrimonious disputes between representatives of the public and the transit company officials. While it is too soon as yet to determine the full effects of the unification, it has become apparent that the millenium was not ushered in last December and that Washington's transportation problem is far from solved. The unique position of the District of Columbia in the life of the Nation makes this and other local problems of more than local significance. A thorough study of the District's transit situation should be of interest to all students of utility problems, not only because of its peculiarities but also because its similarity to situations in other metropolitan areas may enable such a study to contribute something toward a better understanding of local transportation problems in general.

Before examining possible solutions of Washington's local transportation problems, it is advisable to study the historical setting out of which these difficulties have developed. Such a study would logically include (1) the corporate background, (2) the financial and operating background, and (3) the regulatory background.

Corporate Background

The outstanding peculiarity of transportation service in the National Capital prior to December, 1933 was that it was furnished by three companies rather than by one as is frequently the case in cities of comparable size. The Washington Railway and Electric Company and the Capital Traction Company furnished both street car and bus service. The Washington Rapid Transit Company operated busses only.

Washington Railway and Electric Company. Of the three companies involved in the formation of the Capital Transit Company the Washington Railway and Electric Company was the largest. During 1932, for example, it carried 53.15% of the total revenue passengers carried on street cars and busses, operated 53.89% of the total passenger car mileage and received 55.37% of the total operating revenues.[1]

Although it was not incorporated until February 4, 1902, its lineage can be traced through a shifting snarl of intercorporate relationships back to the Metropolitan Railroad Company, which was incorporated in 1864 and which operated as a horse railway until 1896.[2] Control of the Metropolitan Company, seven other street railway companies,[3] and two power companies—the Potomac

[1] Based on annual reports of the three companies as published in the 20th *Annual Report*, Public Utilities Commission of the District of Columbia, 1932.

[2] Opinion and Findings of the Public Utilities Commission of the District of Columbia in *Re Valuation of Washington Railway & Electric Co., etc.*, Order No. 339, September 4, 1919, p. 21.

[3] Columbia Ry. Co., Anacostia & Potomac River R. R. Co., Georgetown & Tennallytown Ry. Co.,

(Footnote 3 continued on page 276)

Electric Power Company and the United States Electric Lighting Company—was acquired between 1896 and 1899 by Messrs. O. T. Crosby, F. C. Stevens, C. A. Lieb, and associates. These gentlemen incorporated the Washington Traction and Electric Company June 5, 1899, as a holding company in order to consolidate their holdings in the above Companies. This Company, in return for the $10,695,000 advanced to it and to the individuals who organized it by the United States Mortgage and Trust Company, turned over to the latter $12,000,000 of collateral trust bonds of the new company and $2,500,000 of its capital stock. The various securities of the operating traction and power companies were deposited with the Trust Company as security for the collateral trust bonds. On August 8, 1899, the Traction Company acquired control of two additional railway companies through a small cash payment, $1,325,000 in collateral trust bonds, and $1,200,000 in capital stock. The total capitalization of the Washington Traction and Electric Company was thus $24,525,000, as compared with a total market value of subsidiary companies' securities of only $12,252,548.51 at the time of issuance of the holding company stocks and bonds.[4]

That this apparent overcapitalization was real was shown conclusively by the subsequent history of the corporation. The first year's interest on the bonds was met out of cash proceeds from sale of bonds and stocks. Its failure to pay the semi-annual interest installment due June 1, 1901, because of the inability of the subsidiary companies to earn enough to cover the interest charges on the holding company's top-heavy capital structure, resulted in the Mortgage and Trust Company instituting foreclosure proceedings. Under the terms of the reorganization growing out of the foreclosure sale of the Traction Company's property, the securities of the subsidiary companies held by the Trust Company were not disturbed. The stocks and bonds of the Washington Traction and Electric Company were exchanged for stocks and bonds of the Washington Railway and Electric Company on February 4, 1902, the incorporation date of the latter company, and the ill-starred Traction Company was dissolved. The discrepancy between the market value of the subsidiary securities held by the old holding company and the par value of the holding company stocks and bonds was reduced only slightly by the above transaction, as the new holding company issued $22,999,600 worth of securities in return for property in the form of securities of the subsidiary light and railway companies valued at only $13,652,882.31.[5] Although subsequent improvement in the earnings of the subsidiaries made possible the payment of bond interest, that the capitalization as a whole was excessive is indicated by the fact that no common stock dividends were paid until 1909.[6]

The Washington Railway and Electric Company was the successor of an operating company as well as of the above mentioned holding company. On June 5, 1900, Congress authorized the

(Footnote 3 continued from page 275)

Brightwood Ry., Washington, Woodside, & Forest Glen Ry., Washington & Great Falls Electric Ry. Co., and the Washington and Rockville Ry. Co. *Ibid.*, pp. 30-34.

[4] This figure represents the most liberal valuation which could reasonably have been made, since each is valued at the highest price of record, whether that be found in the market quotations subsequent to January 1, 1899, or recorded as a private sale on the books of the United States Mortgage and Trust Company (*Ibid.*, pp. 33-4).

[5] *Ibid.*, p. 36. See pp. 17-43 for complete history of the constituent companies.

[6] *Ibid.*, pp. 37-39. See also *Public Utility Compendium*, Oct., 1932, p. 102.

Washington and Great Falls Electric Railway Company, which had operated street cars since its organization in 1892, to acquire the stocks of any or all railway and power companies already controlled by the Washington Traction and Electric Company. It was also authorized to purchase the property and franchise rights of the railway companies but not those of the power companies. On February 4, 1902, it took advantage of this authority, at the same time changing its name to the Washington Railway and Electric Company.[7] All underlying companies, except the Washington and Rockville Railway Company, the Washington and Glen Echo Railroad Company, and the Potomac Electric Power Company, Washington's efficient and prosperous power monopoly, have lost their corporate identity.[8] The relationship between the Railway Company and the Potomac Company is one of the noteworthy features of the corporate history of the former and will receive attention later in this study.

The Washington Railway and Electric Company, prior to the merger of December 1, 1933, was not only an operating traction and bus company and a holding company but was itself a subsidiary of another holding company. The North American Company began to acquire its stock in 1922 and by 1928 had attained a controlling interest. As of December 31, 1932, it owned 50.016% of the voting stock of the Washington Company.[9] Under the terms of the unification agreement which became effective last December, it transferred to the new Capital Transit Company only its transportation properties. The Washington Railway and Electric Company is to continue its existence as a holding company, controlling the Potomac Electric Power Company and 50% of the Capital Transit Company's common stock.[10]

Capital Traction Company. The Capital Traction Company ranked next to the Washington Railway and Electric Company in size. During 1932 its cars and busses carried 42.24% of the total revenue passengers, accounted for 38.39% of the total passenger-car mileage, and earned 39.34% of the total operating revenues.

It was organized March 1, 1895, by act of Congress, to succeed the Rock Creek Railway Company of the District of Columbia, incorporated in 1888, and the Washington and Georgetown Railroad Company, organized in 1862, as a horse-car line.[11] The only subsidiary of the Capital Traction Company in recent years has been the inactive Washington and Maryland Railway Company, whose 2.591 miles of line have been leased and operated by the parent company. Throughout its corporate life the capital stock has been widely held by Washington residents. At the end of 1932, for example, the 20 principal owners combined held only 25,840 shares of the total 120,000 shares outstanding and the largest stockholder owned only 2,643 shares, or 2.2% of the total.[12]

[7] *Ibid.*, pp. 19-20, 29, 189-191.

[8] As of December 31, 1932, the Railway Company controlled the Washington and Rockville Ry. Co. and Potomac Electric Power Co. through 100% voting stock ownership and the Washington & Glen Echo R. R. Co. through 98% voting stock ownership. Several small railway, bus, and electric companies were, in turn, controlled by the Rockville and Potomac Companies. (See 20th *Annual Report*, Public Utilities Commission of the District of Columbia, 1932, p. 102.)

[9] *Ibid.*, p. 103.

[10] See *Definitive Unification Agreement*, approved by the Public Utilities Commission of the District of Columbia, September 28, 1933.

[11] Opinion and Findings of the Public Utilities Commission of the District of Columbia in *Re Valuation of the Capital Traction Co.*, Order No. 339, Sept. 4, 1919, pp. 11-12.

[12] The holder of the block of 2,643 shares was Robert

(Footnote 12 continued on page 278)

This brief recital of the corporate background of the Capital Traction Company shows that it has differed from the Washington Railway and Electric Company in three important respects: (1) its corporate history has been much simpler; (2) it has been distinctly an operating transportation company; (3) it has been free from absentee ownership and holding company control and, indeed, concentrated control even on the part of local interests. The unification agreement, which became effective December 1, 1933, provided for the transfer of all operating and non-operating properties of the Capital Traction Company to the new Capital Transit Company and for the prompt dissolution of the Traction Company.[13]

Washington Rapid Transit Company. By far the smallest of the three companies is the Washington Rapid Transit Company. Its busses carried only 4.5% of the total revenue passengers hauled by all companies in 1932, its bus-miles amounted to 7.8% of the total car and bus mileage, and it earned 5.29% of the total operating revenues.

The company was incorporated January 20, 1921. Although this is nominally an independent company, it is actually dominated by the North American Company. Mr. Harley P. Wilson, a director of both the North American and Washington Railway and Electric Companies, on December 31, 1931 owned 21,227 shares, or 98.22%, of the outstanding stock.[14] Control of the Rapid Transit Company had been secured originally by the North American Company in 1925, and by 1927 the 21,227 shares now held by Mr. Wilson had been acquired by the Company. This was done apparently with the object of getting control of the Washington transportation properties and eventually merging them in accordance with an act passed by Congress March 4, 1925, authorizing such a merger.[15] The North American Company transferred the stock to Mr. Wilson in 1927, because some doubt existed as to the legality of its ownership of the Transit Company stock. While the above act of Congress specifically exempted *street railway corporations* from the LaFollette Anti-Merger Act of 1913,[16] which prohibited foreign corporations from owning more than 20% of the voting stock of public utility companies operating in the District of Columbia, it said nothing about *bus* companies. By transferring the bus company's stock to one of its own directors, the North American Company thus freed itself from possible legal difficulties and, at the same time, maintained working control over the Company.[17]

The Washington Rapid Transit Company is of greater significance in connection with this study than its slight importance as a transportation agency would indicate because of its relation to the important merger problem. Since it was the first transit company in the

(Footnote 12 continued from page 277)

Sealy, treasurer of the North American Company. See 20th *Annual Report*, Public Utilities Commission of the District of Columbia, 1932, pp. 81-2. This checks roughly with the report of Federal Trade Commission accountants to the effect that the North American Company owned 3,012 shares, or 2½%, of the voting stock of the Capital Traction Company as of December 31, 1929. (See *Utility Corporations*, Senate Doc. 92, Parts 33-34, 70th Congress, 1st Session, pp. 112-114.) Although Mr. Sealy's name appears among the 20 largest stockholders each year from 1926-1932, inclusive, at no time is the North American itself included in this list. (See *Annual Reports*, Public Utilities Commission, 1926-1932, inclusive.)

[13] See *Evening Star* (Washington), December 1, 1933.

[14] 20th *Annual Report*, Public Utilities Commission of the District of Columbia, 1932, pp. 167, 101.

[15] Public, No. 602, 68th Congress, 43 U. S. Stats. 126.

[16] Sect. 11 of Public, No. 435, 37 U. S. Stats. 974.

[17] See *Utility Corporations*, Senate Document 92, Parts 33 and 34, 1st Session, 70th Congress, June 15, 1931, pp. 112-114 for a full account of these transactions by a Federal Trade Commission investigator.

District to be controlled by the North American Company, the acquisition of its majority stock can be thought of as the first definite step in this holding company's unification activities. The Rapid Transit Company, however, was not a party to the December, 1933 unification agreement. The agreement merely authorized the new Capital Transit Company to acquire the stock of the Rapid Transit Company on such terms as may be accepted by the owners of said stock and may be approved by the Public Utilities Commission, the latter company to be dissolved if and when a majority of its stock is acquired by the Capital Transit Company. Although definite negotiations were entered into for the purchase of this stock as early as October, 1933, the Rapid Transit Company is still operating as a separate corporation. It is, of course, merely a question of time before its absorption into the unified company will occur.[18]

Financial and Operating Background

In order to get an accurate picture of the Washington transportation problem, attention must be given to the financial results of the operating activities of the three companies. Changes in the economic status of the companies are indicated roughly in Table I, which presents each concern's corporate surplus at the end of each year from 1913 to 1933, inclusive, and a figure for each year representing the ratio of operating income to total capital invested.[19]

It is obvious, from an examination of these data, that the Washington Rapid Transit Company's operations have been financially unsuccessful, almost from its inception. Further, the Capital Traction Company, contrary to the experience of most street railway companies, improved its financial position considerably between 1913 and 1921, continued to operate with a reasonable degree of success until 1925, and experienced a steady decline in both surplus and rate of return from 1925 through 1933.[20] The Washington Railway and Electric Company's operations cannot be summarized as easily. While both measures indicated an unfavorable trend from 1913 to 1920, in subsequent years the surplus increased steadily while the rate of return tended downward. Moreover, the Washington Company showed a uniformly smaller annual rate of earnings upon investment than the Capital Company throughout the entire period from 1913 to 1933, inclusive. The explanation of the growing surplus in the face of declining operating income is found in the fact that the

[18] See *Evening Star*, December 1, 1933, September 19, 1933, and October 23, 1933.

[19] The writer realizes that these are but rough measures of changing financial status. Changes in corporate surplus may, of course, reflect financial *policy* rather than financial *condition*. The ratio of operating income (i. e., operating revenues, less operating expenses, depreciation, and taxes) to total capital invested (i. e., stated value of bonds and stocks plus surplus) is not, generally speaking, as widely used as the capital turnover ratio—total revenue to total capital invested—or the ratio of net income to net worth. The former ratio, however, has certain definite advantages over the other ratios. It is more refined than the capital turnover ratio in that it is free from the distorting influence of operating expenses. It is broader than the net worth ratio in that it measures the return upon total capital invested rather than merely the stockholders' return. It thus conforms more closely to the general idea of "rate of return" upon the "fair value" of utility property. In the absence of up-to-date valuation figures accepted by both utilities and public representatives, the figure is perhaps as close as it is possible to come to a measure of the return upon the property of the companies. In any case, the two indices, imperfect as they are, do show clearly the general trend in the financial status of each company.

[20] The merging of the two traction companies December 1, 1933 makes it necessary to apportion on an arbitrary basis the December earnings of the new Capital Transit Company between the two old companies in order to arrive at comparable 1933 figures for each of the old companies. The basis chosen was the relation the earnings of each company bore to the combined earnings of both companies during the year 1932.

Washington Company's non-operating income has been larger than its operating income since 1925 and never less than 50% of the operating income in any year since 1913. Most of this large non-operating income has been in the form of dividends derived from the Company's $6,000,000 investment in the stock of the prosperous Potomac Electric Power Company. This large investment item also explains to some extent the lower rate of return received from operations by the Washington Company, as compared with the Capital Company, since the latter has no such large investment yielding a correspondingly large non-operating income. Table II shows the amount of dividend income received from the Power Company and other data indicative of the backlog of financial strength which its power holdings have given to the Washington Railway and Electric Company during a period of poor transportation business.

Further light is shed upon the history of the operations of the three companies by Tables III and IV. Table III indicates that both traction companies enjoyed a tremendous increase in number of passengers as well as in operating revenues in 1918 and 1919. This was traceable, of course, to the concentration of war workers in Washington during those years. Net income rose also,

TABLE I. FINANCIAL STATUS OF LOCAL TRANSPORTATION COMPANIES, WASHINGTON, D. C., 1913-33.*

Year	Washington Railway & Electric Co.†		Capital Traction Co.		Washington Rapid Transit Co.	
	Corporate Surplus	Rate of Return‡	Corporate Surplus	Rate of Return‡	Corporate Surplus	Rate of Return‡
1913	$ 982,135	3.66%	$ 82,023	5.73%	.....	.....
1914	980,049	3.42	151,490	5.02	.....	.....
1915	998,634	2.70	195,014	5.17	.....	.....
1916	998,039	2.91	284,207	5.10	.....	.....
1917	641,515	1.70	329,547	5.94	.....	.....
1918	587,543	2.41	497,493	6.44	.....	.....
1919	458,799	1.91	497,355	7.68	.....	.....
1920	738,153	3.09	693,544	8.92	.....	.....
1921	1,308,714	3.96	1,089,586	9.28	$ 5,024§	3.14%§
1922	1,809,442	3.11	1,354,567	7.40	811	4.46
1923	2,184,243	3.05	1,524,240	6.38	3,518§	3.20§
1924	2,441,496	2.86	1,528,484	6.00	11,883	5.93
1925	4,667,239	2.67	1,478,246	5.71	42,653	13.09
1926	5,274,660	2.79	1,410,642	5.86	100,340§	35.58§
1927	6,031,706	2.87	1,227,304	5.33	169,525§	32.04§
1928	6,888,842	2.81	1,008,128	5.04	199,263§	1.04
1929	8,252,790	2.65	759,593	4.88	205,124§	13.00
1930	9,533,922	2.16	708,488	4.55	230,916§	2.24
1931	10,755,400	2.07	676,119	3.92	278,643§	7.97§
1932	11,594,570	0.97	647,069	2.26	341,669§	14.26§
1933	12,524,418¶	0.84 ‖	831,851¶	2.15 ‖	385,567§	5.82§

*Based on the annual reports of the companies as contained in the *Annual Reports*, Public Utilities Commission of the District of Columbia, 1913-1933, inclusive. The 1933 data were obtained through the courtesy of Mr. B. M. Bachman, Chief Accountant, Public Utilities Commission, Mr. A. G. Neal, Vice-President and Comptroller, Washington Railway and Electric Co., and Mr. E. D. Merrill, President, Washington Rapid Transit Co.

†Including City and Suburban Railway of Washington and the Georgetown and Tennallytown Railway Co., subsidiaries, which reported separately to the Commission prior to October 31, 1926, when the Washington Railway and Electric Co. purchased all property of these subsidiaries.

‡ Ratio of operating income, after operating expenses, depreciation, and taxes to total capital invested for the years 1913-1933, inclusive. The "total capital invested" figure for the two traction companies is the sum of the stated value of securities outstanding and surplus. For the Washington Rapid Transit Co., it includes only the stated value of the securities, because of the continued existence of a large balance sheet deficit instead of a surplus.

§ Deficit.

¶ As of November 30, 1933, when the Capital Transit Co. took over the transportation properties of both companies.

‖ Based upon earnings for the first 11 months plus the earnings of the Capital Transit Co. during December, apportioned between the two old companies according to the relative operating revenues of each company during 1932.

in spite of higher operating expenses. The Capital Traction Company was particularly prosperous because it served the older, more densely populated sections of the city where the demand for traction service was heavy. The Railway Company's lines extended out to the newer, sparsely settled suburban sections where the traffic density was much lower. The data presented in Table IV, showing the greater number of revenue-passengers per car-mile carried by the Capital Company, especially during the war years, evidence this difference in the density of traffic on the lines of the two companies.

TABLE II. DIVIDENDS RECEIVED BY WASHINGTON RAILWAY & ELECTRIC CO. ON STOCK OF POTOMAC ELECTRIC POWER CO. AND EFFECT UPON ITS RATE OF RETURN, 1913-1933*

Year	Dividends Received (in thousands)	Rate of Dividends†	Gross Rate of Return‡	Net Rate of Return§
1913..	$ 600	10%	5.40%	3.66%
1914..	600	10	5.11	3.42
1915..	660	11	4.92	2.70
1916..	660	11	4.83	2.91
1917..	660	11	3.62	1.70
1918..	660	11	4.32	2.41
1919..	540	9	3.46	1.91
1920..	480	8	4.47	3.09
1921..	600	10	5.66	3.96
1922..	600	10	4.79	3.11
1923..	600	10	4.74	3.05
1924..	600	10	4.50	2.86
1925..	840	14	4.90	2.67
1926..	960	16	5.45	2.79
1927..	1,080	18	5.82	2.87
1928..	1,200	20	5.94	2.81
1929..	1,320	22	6.05	2.65
1930..	1,440	24	6.08	2.16
1931..	1,560	26	5.98	2.07
1932..	1,680	28	5.10	0.97
1933..	1,800	30	5.13	0.84

*Sources of data are the same as those used in Table I.
†Ratio of annual dividends to the amount of the Washington Railway & Electric Co.'s investment in stock of the Potomac Electric Power Co., which remained at $6,000,000 during each of the above years. Prior to 1925, this included $250,000 of preferred stock and the balance in common stock. In that year the preferred stock was converted into common stock, and the entire $6,000,000 has since consisted of common stock, which constitutes 100% of the voting stock of the company.
‡Ratio of operating income plus dividend income from the Power Company to stated value of securities and surplus.
§Exclusive of dividend income received from the Power Company.

Although operating revenues continued to increase during 1920 and 1921,[21] the number of passengers carried by each company declined steadily from 1919 to 1929 and dropped sharply in 1930, 1931, 1932, and 1933. Operating revenues after 1921 followed a similar course. The decline in both passengers and revenue was greater in the case of the Capital Traction Company, as the rapid settlement of the suburban areas served by the Railway Company partially offset the loss in passenger traffic in the District as a whole.

The Traction Company's revenues declined so drastically and operating expenses declined so sluggishly, as indicated in Table IV, that its net income shrank steadily from the 1921 peak of $1,412,000 to the low figure of $57,000 in 1932. It is not surprising that the quarterly dividend, which had been progressively reduced from 1¾% in 1929 to ¼ of 1% July 1, 1932, was discontinued October 1, 1932, thus breaking a consecutive dividend record which dated back to 1898.[22] While the dividend income from the Potomac Electric Power Company has maintained the net income of the Washington Railway and Electric Company at a high level as compared with earlier years, yet even an increase of $120,000 in this dividend income in 1932 was not sufficient to offset the serious decline in operating revenues, with the result that net income declined 15.25% as compared with 1931. Had it not been for this non-operating income, the Railway Com-

[21] This is accounted for chiefly by increased fares. The revenue received per passenger carried on the lines of both traction companies, i. e., the average fare, increased 35.59% between 1919 and 1920 and an additional 3.63% between 1920 and 1921.

[22] See *Public Utility Compendium*, October, 1932, p. 148; *Annual Reports*, Public Utilities Commission of the District of Columbia, 1913-1932, inclusive; and the *Evening Star*, July 26, 1931, December 15, 1931, June 10, 1932, and September 8, 1932.

pany's net income history would have been only slightly less favorable than that of the Capital Traction Company.

The data relating to the Washington Rapid Transit Company in Tables III and IV are almost self-explanatory. They indicate that, while the company showed some signs of growth and ultimate financial success prior to 1930, it had never reached the status of a going, successful concern and that since 1930 it has suffered in much the same manner as the traction companies. Had it been an independent company rather than one which has been fostered by the strong North American Company for its potential value as a part of a unified, coordinated transportation system for the District as a whole, it would long since have abandoned operations.

If this study had been made at the end of 1932 or even as late as October, 1933, the reader would have been left to muse upon the above gloomy picture and this study would have proceeded at once to a consideration of the causes of this bad state of affairs and of possible remedies. Light, however, in the form of improved revenues, broke through the gloom in October, and, as the data presented in Table V indicate, continued to shine forth during the ensuing months. The turn in the tide for the local transit companies was perhaps shown most sharply by the ability of the Capital Traction Company to earn sufficient net income in October to turn a deficit of almost $20,000 for the first 9 months of 1933 into a net gain for the first 10 months of approximately $3,500. Its

TABLE III. OPERATING DATA, WASHINGTON RAILWAY & ELECTRIC CO., CAPITAL TRACTION CO., AND WASHINGTON RAPID TRANSIT CO., 1913-1933.*
(000's omitted)

Year	Washington Railway & Electric Co.				Capital Traction Co.				Washington Rapid Transit Co.			
	Operating Revenue	Operating Expense	Net Income	Number of Passengers	Operating Revenue	Operating Expense	Net Income	Number of Passengers	Operating Revenue	Operating Expense	Net Income	Number of Passengers
1913.....	$3,080	$1,715	$1,047	63,476	$2,310	$1,179	$ 723	53,425	.....	.....	.....	.....
1914.....	3,057	1,785	962	63,534	2,256	1,150	697	52,227	.....	.....	.....	.....
1915.....	3,062	1,874	973	63,754	2,206	1,152	644	51,003	.....	.....	.....	.....
1916.....	3,162	1,979	961	66,620	2,289	1,237	636	53,483	.....	.....	.....	.....
1917.....	2,925	2,153	451	58,765	2,784	1,533	797	64,286	.....	.....	.....	.....
1918.....	4,018	2,972	688	78,160	3,530	2,083	888	79,186	.....	.....	.....	.....
1919.....	5,410	4,497	318	88,910	4,536	2,831	113	90,104	.....	.....	.....	.....
1920.....	6,736	5,283	677	85,416	5,467	3,302	1,326	77,749	.....	.....	.....	.....
1921.....	6,833	5,024	1,134	83,161	5,501	3,221	1,412	75,913	$116	$118	$ 5†	1,379
1922.....	6,302	4,825	886	80,521	4,994	3,167	1,105	73,524	286	277	6	3,536
1923.....	6,224	4,788	899	79,254	4,843	3,128	1,018	71,680	324	329	5†	4,027
1924.....	5,969	4,549	982	75,620	4,614	3,074	856	68,463	338	322	15	3,930
1925.....	5,992	4,608	1,166	75,416	4,587	3,114	788	67,619	479	427	53	5,234
1926.....	6,015	4,530	1,365	75,028	4,617	3,108	803	67,270	487	555	88†	5,611
1927.....	5,865	4,365	1,573	74,067	4,479	3,109	707	64,780	486	547	89†	4,986
1928.....	5,784	4,246	1,734	72,622	4,344	3,066	620	62,815	560	549	32†	5,426
1929.....	5,790	4,330	1,911	72,311	4,297	3,084	562	61,291	600	555	7†	5,628
1930.....	5,558	4,311	1,870	66,004	4,165	3,026	489	55,977	599	573	28†	5,440
1931.....	5,287	4,016	2,023	59,806	3,838	2,829	366	48,469	539	557	49†	4,886
1932.....	4,533	3,791	1,715	52,475	3,221	2,604	57	41,681	433	464	63†	4,514
1933‡....	4,157	3,469	1,792	49,937	2,950	2,426	60	37,118	376	388	44†	3,965

* Sources of data are the same as those used in Table I.
† Deficit.
‡ The 1933 figures for the Washington Railway & Electric Co. and the Capital Traction Co. are based upon the actual data for the first 11 months and an apportionment of the figures covering the December operations of the Capital Transit Co., between the two old companies. This is done in order to make the 1933 data roughly comparable with the data for each of the other years.

November operations resulted in swelling the net income for the first 11 months of the year to $10,700 and, with the consolidation of the two old companies into the Capital Transit Company on December 1, the net income apportionable to the Capital Traction Company pushed the net earnings for the 12-month period up to almost $60,000, slightly more than the net return in 1932.[23]

Although the Washington Railway and Electric Company's relations with the Potomac Electric Power Company prevent changes in its monthly net income from being a very serviceable source of information as to changes in the condition of the transit business, analysis of its monthly report shows that its experience in October and November, 1933 was similar to that of the Traction Company.[24]

Further evidence of the improved status of the transportation industry in the District is found in the fact that the net income of the Capital Transit Company during December, 1933, and January, 1934, exceeded the combined net profit of the two old companies during the same period of the preceding year by over $200,000.[25] Summarizing these recent developments, it appears that

[23] *Evening Star*, November 21, 1933; January 31, 1934; and February 21, 1934.

[24] *Ibid.*, October 26, 1933; November 23, 1933; and December 28, 1933.

[25] *Ibid.*, February 21, 1934. See also *Facts and Figures on Washington Securities*, 8th ed., 1934, issued by Y. E. Booker & Co., pp. 8-10, 21.

TABLE IV. REVENUE PASSENGERS AND OPERATING EXPENSES PER CAR-MILE, WASHINGTON RAILWAY & ELECTRIC CO., CAPITAL TRACTION CO., AND WASHINGTON RAPID TRANSIT CO., 1913-1932.*

Year	Washington Railway & Electric Co.				Capital Traction Co.				Washington Rapid Transit Co.	
	Passengers per		Operating Expense† per		Passengers per		Operating Expense† per		Passengers per	Operating Expense† per
	Car-mile	Bus-mile	Car-mile	Bus-mile	Car-mile	Bus-mile	Car-mile	Bus-mile	Bus-mile	Bus-mile
1913	6.13	.....	$.166	.....	6.51	.....	$.144	.....	.....	.....
1914	6.14	.....	.173	.....	6.38	.....	.141	.....	.....	.....
1915	6.20	.....	.183	.....	6.53	.....	.147	.....	.....	.....
1916	6.36	.....	.189	.....	6.90	.....	.159	.....	.....	.....
1917	5.87	.....	.215	.....	8.19	.....	.195	.....	.....	.....
1918	7.00	.....	.265	.....	9.47	.....	.249	.....	.....	.....
1919	7.09	.....	.358	.....	9.53	.....	.299	.....	.....	.....
1920	7.07	.....	.438	.....	7.93	.....	.337	.....	.....	.....
1921	7.14	.....	.432	.....	7.78	.....	.330	.....	2.21	$.194
1922‡	6.93	.....	.415	.....	7.70	.....	.322	.....	2.36	.185
1923	6.59	.....	.398	.....	7.45	.....	.322	.....	2.37	.195
1924	6.37	.....	.383	.....	7.22	.....	.324	.....	2.46	.214
1925	6.15	.....	.376	.....	7.07	.....	.325	.....	3.18	.260
1926	5.90	.....	.364	.....	6.82	.....	.315	.....	3.40	.343
1927	5.78	.....	.340	.....	6.75	.....	.330	.....	3.18	.349
1928	5.59	.....	.326	.....	6.32	.....	.308	.....	3.06	.310
1929	6.09	2.17	.346	$.208	7.21	1.75	.338	$.221	3.04	.299
1930	5.65	2.22	.352	.204	6.72	1.65	.339	.216	2.51	.265
1931	5.17	2.14	.337	.191	6.01	1.61	.328	.207	2.41	.264
1932	4.77	1.96	.331	.184	5.29	1.48	.312	.166	2.44	.239

* Sources of data are the same as those used in Table I. Figures for 1933 are not included because complete, comparable data are not available. Revenues per car-mile and per bus-mile are not shown because of differences in the rate structures of the three companies.

† Includes depreciation but not taxes.

‡ The figures for the two traction companies for 1922-1928, inclusive, are based upon motor-bus as well as street-car operations. Both companies began to operate busses in 1922, but the results of the bus operations were not clearly segregated by both companies in their annual reports until 1929.

during the last two months of transportation operations by the Washington Railway and Electric Company and the Capital Traction Company and the first two months of operations by the Capital Transit Company, not only was 1933 saved from being the worst year ever experienced by the two railway companies, but the downward trend of the Washington local transportation industry, which had set in definitely in 1922, was abruptly checked. It remains to be seen whether the new trend which has been in evidence since October, 1933, is merely a temporary check to the decline of the industry or whether the industry has actually been given a new lease on life.

TABLE V. COMPARISON OF COMBINED MONTHLY REVENUES OF WASHINGTON RAILWAY & ELECTRIC CO. AND CAPITAL TRACTION CO., SEPTEMBER, 1932-JANUARY, 1933, WITH COMBINED REVENUES, SEPTEMBER, 1933-NOVEMBER, 1933, AND REVENUES OF CAPITAL TRANSIT CO., DECEMBER, 1933, AND JANUARY, 1934.*

Month	Combined Operating Revenue of Washington Railway & Electric Co. and Capital Traction Co., 1932-3	Combined Operating Revenue of Washington Railway & Electric Co. and Capital Traction Co., 1933	Revenue of Capital Transit Co., 1933-4
September..	$583,113	$560,616	.....
October....	635,166	632,821	.....
November..	605,843	619,436	.....
December..	644,317	.....	$664,628
January....	603,536	.....	666,389

*Sources of data are the same as those used in Table I.

Analysis of Financial Background. The above picture of the financial and operating background of the local transportation situation in the District of Columbia calls for a consideration of the underlying causes of the decline of the industry between 1921 and the present, as well as an analysis of the factors which have been responsible for the upturn in recent months. Such an analysis may aid in determining whether or not the basic factors responsible for the decline of a once prosperous industry have been removed and thus provide a sound basis for determining whether the transit problem is or is not well on the road toward solution.

The causes of the serious financial situation described above are not difficult to find. Indeed, they can all be summarized under the one general head of competition. "External" competition in the form of motor vehicles has, of course, been the chief source of trouble. "Internal" competition, however, as illustrated by the existence of three mass transportation companies in the District, has also contributed to the economic troubles of the industry.

Most of the external competition has been provided by private automobiles and taxicabs, as motor busses, the descendants of the old "jitneys" which caused traction companies throughout the country so much trouble 20 years ago, have generally been operated either by the car companies themselves or by the Washington Rapid Transit Company, which, as pointed out above, is closely affiliated with the Washington Railway and Electric Company.[26]

Private automobiles were largely responsible for the steady decline in traffic until 1930. This type of competition has been unusually severe in Washington because of the abnormally large number of automobiles in the com-

[26] Motor-bus competition has been limited to that offered by various suburban bus companies running between Washington and nearby Maryland and Virginia and has been slight. The only recent example was the carrying of local passengers for a 5c fare by two Virginia companies in June, 1933. It was short-lived. (See *Evening Star*, July 18 and 21, and August 14 and 15, 1933.)

munity. According to a 1930 study,[27] Washington, in that year, had one car for every three persons, which indicated automobile saturation greater than in other cities of comparable size. A primary reason for this situation is the presence of a large body of government employees with relatively high and stable earnings as compared with the large body of low-paid, seasonally-employed workers ordinarily found in industrial cities. A second reason for the large number of private automobiles in the Capital City is the complete absence of rapid transit facilities, such as subway and elevated systems. The wide avenues which radiate from the heart of the city in a diagonal manner put a premium on automobile transportation when compared with the street railways and, to a lesser extent, the busses with their round-about routes and frequent stops. Parking difficulties and traffic jams, serious though they are, have not offset the advantages of private automobiles over Washington's street cars and busses.[28]

The acute decline in the business of the traction companies since 1930 can be traced largely to the competition of unregulated, cut-rate taxicabs. Previous to 1930 the higher rate of fare of the orthodox meter-variety of taxicab and the inherent weakness of an irregular, non-scheduled service prevented taxis from competing seriously with the trolley cars and busses. The advent, however, during the early summer of that year of a fleet of flat-rate taxicabs, charging a fare of 35c between any two points in the "city proper" marked the beginning of a new era. The public took to this speedy, relatively inexpensive type of transportation with delight and owners of the new cabs prospered. Their success caused the District to be veritably swamped with new cabs, many of them owned by private individuals who operated their own cabs. The "old-line" meter cab companies were forced to adopt the flat-rate system. Competition between the old and new companies and individual owner-drivers forced the fare down still lower—first to 25c, then to 20c, then 15c, and on down. At one time it was possible for four persons to secure a ride throughout a rather large area for 5c. Eventually, fares became stabilized at a flat rate of 20c anywhere within the city proper. The figures presented in Table III, showing the general decline in operating revenues and passengers carried during 1930-1933, inclusive, offer mute testimony as to the effect of taxicab competition upon the scheduled transportation companies.[29]

While public regulation and the long established amicable operating relations among the traction companies and the bus company have prevented competition between and among these companies from resulting in anything like the ruinous, cut-throat situation produced by the influx of thousands of unregu-

[27] The study was made by Dr. Miller McClintock and C. W. Eliot, under the auspices of a semi-governmental body known as the Automobile Parking Committee. (See *Evening Star*, August 9-18, inclusive, 1930, for analysis of this Committee's report.)

[28] The McClintock study emphasized the serious lack of parking facilities and made specific recommendations. The problem of developing a unified system of traffic control, including traction, bus, taxicab, and private automobile traffic, has continued to occupy the attention of civic and governmental groups. (See *Evening Star*, January 2, 4, and 18 and February 15 and 16, 1934.)

[29] Between April, 1930, and April, 1931, the number of registered cabs had increased from 2,300 to 3,500. By the end of 1933, 6,616 cabs were known to be in existence by the District Traffic Bureau. The above condensed account of the taxicab situation is based upon numerous items appearing in the *Evening Star* during 1930-1934, inclusive, especially on June 19, 1930; September 10, 1930; April 12, 1931; July 23 and 24, 1931; October 19, 1931; January 19 and October 1, 1932; September 30, 1933; and January 30, 1934.

lated taxicabs, such internal competition has nevertheless proved itself to be wasteful and economically unsound. Much unnecessary duplication of trackage, equipment, and personnel have occurred. In so far as each of the three companies has been prevented from securing the full advantages of large-scale operation, each has operated at higher costs per passenger-mile than would be possible under unified operation. No economic justification exists at the present time for competition between mass transportation agencies in Washington or any other city, regardless of the justification for such competition that may have existed in the pioneer days of the industry.[30]

In looking for explanation of the improvement in the local transportation business in recent months, it is obvious that a major cause has been the unification of the Capital Traction and Washington Railway and Electric Companies into the Capital Transit Company. Although this has already resulted in some economies,[31] it does not explain the increased revenues. The usual seasonal increase during the autumn and the World Series contributed, undoubtedly, to the higher October revenues. The major factors, however, in explaining the upturn were (1) the great increase in governmental activity and resultant growth in population, both of a semi-permanent and transient variety, which developed out of the "New Deal", and (2) the general increase in taxicab fares, which became effective on the lines of the major cab operators October 1.[32] While no accurate figures are available to show the specific influence of these two factors, traction officials attribute much of the October and November increase in business to them.[33]

Increased governmental activity and higher cab fares do not explain, however, the great improvement in traffic during December and January, although the convening of Congress in the latter month would have some tendency to boost car and bus traffic. The inauguration by the Capital Transit Company on December 3 of a "weekly pass" system is generally recognized as the chief cause of the excellent showing of the traction lines during these months. The travelling public and the utility officials alike have been greatly pleased with the weekly pass experiment and the original trial period of three months has been extended to May 31, 1934.[34]

Of the factors responsible for the decided improvement in the financial condition of the transit industry, only the merger is definitely of a permanent nature. The weekly pass is still viewed as an experiment, although, if its popularity continues to grow, it will

[30] See the treatment of the Washington situation as an example of competition in Ruggles, C. O., *Problems in Public Utility Economics and Management* (New York: McGraw-Hill Book Co., 1933), pp. 65-67. For a general discussion of the economic aspects of street railway competition, see Jones, E. and Bigham, T. C., *Principles of Public Utilities* (New York: Macmillan Co., 1931), pp. 84-85.

[31] Y. E. Booker & Co., a Washington securities company, calls attention to the annual saving of $400,000 which the Capital Transit Company will realize under the new depreciation method which has been put into effect and approved by the Commission. See its booklet entitled *Facts and Figures on Washington Securities*, 8th ed., 1934, p. 9 and *Evening Star*, March 3, 1934. The merger has not been in effect long enough as yet to determine the extent of economies to be secured under unified operation.

[32] See *Evening Star*, September 30, 1933.

[33] See *Ibid.*, October 6 and 28, and November 1, 1933.

[34] See Booker study referred to above and *Evening Star*, January 30, February 27, and March 3, 1934. Chief Accountant Bachman of the Public Utilities Commission, in a letter to the writer dated March 24, 1934, states that the weekly pass sales increased from 29,033 during the week ending December 9, 1933 to 49,769 during the week ending February 24, 1934 and estimated that the average daily number of pass rides increased from 102,129 during December to 141,466 during the first 24 days of February.

undoubtedly find a permanent place in the rate structure. The tempo of government activity will undoubtedly decline as the national emergency becomes less acute and the stimulus which it has given to the demand for local transportation will probably wear off. This is substantially what happened during the post-war years. Finally, since the action of the taxicab companies in increasing fares was purely voluntary, there is no permanent assurance that these fares will be maintained and the taxicab situation prevented from again becoming as chaotic as it was between June, 1930, and October, 1933.

Of the two underlying causes of the financial troubles of the transportation lines between 1921 and 1933, only the latter—internal competition—has been removed. The favorable effects of the merger upon the financial condition of the industry, moreover, should not lead us to jump to the conclusion that it has automatically solved all transportation problems of the District. The widespread and vigorous public criticism of the quality of service rendered by the new Company is ample evidence of the fact that the merger has not proved to be a cure-all. Nor does it follow that, because the weekly pass and the higher taxicab rates have lessened somewhat the seriousness of "external competition", these two devices are in themselves guarantees that the Washington public will be furnished a high quality of transportation service at reasonable rates.

It is thus necessary to analyze carefully the possibilities of these and other solutions of the local transportation problem in the District. Since virtually all possible attempts to work out solutions of any public utility problems in this day of broad governmental control of public utilities requires the cooperation of government, the first step toward making such an analysis is to examine carefully the regulatory background of the District's transportation problem.

Regulatory Background

Washington is unique among American cities in that its transportation and other utility services are not in any degree controlled by the local consumers or their representatives. All such control is in the hands of the United States Government. Citizens of Maine, of Arizona, and of every other state exercise a greater measure of legal control over the public utilities in the District of Columbia than do the voteless citizens of the District. This, in itself, is sufficient to make the local transportation problem of the Capital of more than local significance.

The history of transportation regulation in the District is divided sharply into two periods by the date March 4, 1913, when Congress created the Public Utilities Commission of the District of Columbia.[35] Prior to that date utility companies were regulated directly by Congress and, after 1908, in certain respects, by the Interstate Commerce Commission. Since 1913, the regulatory powers have been exercised by the Public Utilities Commission, subject to rather broad provisions for appeal to the courts, and also by Congress, acting directly. Because the periods during which the various types of regulation were in existence overlap somewhat, a functional rather than a chronological approach to a study of the regulatory background of the Washington transportation problem is advisable. This

[35] Section 8 of an act making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June 30, 1914, and for other purposes (37 U. S. Stats. 974).

approach leads to a consideration of (1) charter regulation, (2) regulation by statute, and (3) commission regulation.

Charter Regulation. The earliest and, for many years, the only method of regulation was the corporate charter method. These charters were special rather than general charters, as Congress passed separate acts for the incorporation of each of the early companies.[36] In addition to giving the corporations the usual rights and duties contained in any corporate charter and the special right to operate through specified streets in the District of Columbia, these acts also provided for the rate of fare to be charged[37], the character of construction and type of service,[38] the submission of annual reports, and similar matters. These original charters were amended from time to time, also by special Acts of Congress, to provide for extensions of lines,[39] changes in fare, changes in motive power and methods of construction,[40] acquisition of the stock and/or properties of other companies, change in corporate name, and the usual changes for which any corporate charter may be amended.

Regulation by Statute. Concurrent with and subsequent to the passage of special charter acts, Congress has also passed general regulatory measures. Typical of the legislation passed prior to 1913 was an act establishing a uniform fare throughout the District of five cents, six tickets for 25 cents,[41] and another prohibiting one-horse cars within the City of Washington.[42]

The act creating the Public Utilities Commission did not entirely do away with Congressional attempts to regulate the transportation utilities directly. Probably the most important instance of this direct action was the act of March 4, 1925, which authorized the merger of the District's street railway corporations if and when the terms of such merger should be approved by the stockholders, the Commission, and both houses of Congress.[43] The Utilities Commission was empowered and directed by an act passed February 21, 1931, to establish reduced fares for

[36] This statement is subject to some modification, as Congress did pass a general incorporation act May 5, 1870, and a number of roads were incorporated under it. At least two lines were incorporated under authority of the short-lived legislative assembly of the District of Columbia. (See Opinion and Findings of Public Utility Commission in *Re Valuation of Washington Railway & Electric Co., etc.*, Order No. 339, September 4, 1919, pp. 21-22.)

[37] The charter of the Washington & Great Falls Elec. Ry. Co., for instance, authorized a 10c fare which continued in effect until Congress amended the charter in 1900 to permit a fare of 5c, 6 tickets for 25c (*Ibid.*, p. 190).

[38] The Connecticut Avenue and Park Ry. Co., in 1868, was chartered to operate a *horse* railway from 17th and Penn. Ave., N. W. to a proposed public park north of the City (*Ibid.*, p. 22). Twenty years later the Georgetown & Tennallytown Ry. Co. was authorized to construct a line of *cable* or *electric* railway from Georgetown to the District Line (*Ibid.*, p. 27). The original charter of the Eckington & Soldiers Home Ry. Co. authorized the operation of a railway by *horse*, *cable*, or *electric* power from N. Y. Avenue and 7th St. N. W. to Eckington (*Ibid.*, p. 24).

[39] The charter of the Columbia Ry. Co., for instance, was amended in 1898 to permit an extension of its lines from 15th & H Sts., N. W. to the eastern boundary of the District (*Ibid.*, p. 20).

[40] In 1896 Congress directed the Capital, North O St., and S. Washington Ry. Co. to try out compressed air motors and, if unsuccessful, to substitute on all its city lines the underground electric system for the overhead trolley (*Ibid.*, p. 23). Similar direction was given to the Brightwood Ry. Co. in 1898 on pain of having its charter repealed (*Ibid.*, p. 21).

[41] 28 U. S. Stats. 78, approved May 25, 1894.

[42] 27 U. S. Stats. 334, approved July 29, 1892. Special reference should be made to the so-called "Enabling Act" of March 5, 1900, which, though it related to only 11 companies, was nevertheless of great general significance. It gave these companies the right to enter into contracts with each other for the use of their respective roads and authorized the Washington & Great Falls Ry. Co. to take steps which led to the formation of the Washington Railway & Electric Company. This act really amended the charters of the various companies but might also be thought of as general legislation because of its influence on the general transportation situation.

[43] 43 U. S. Stats. 126.

school-children.[44] Measures of this type differed considerably from the laws passed before 1913 in that they are concerned with broad policies and direct the Public Utilities Commission to work out the details for putting these policies into effect. Considerable discretion is given to the Commission. Representative Blanton's amendment to the 1933 Appropriation Act for the District Government, which prohibited the Commission from using any of its appropriation to enforce its order requiring all taxicabs to install meters, was obviously of a different type, since it was a deliberate attempt to override an action of the Commission and substitute the judgment of Congress for the judgment of an expert administrative body which Congress itself had created.[45] It is not to be expected, however, that Congress will continue to attempt to regulate the transportation industry directly except in so far as it may attempt to formulate broad policies the details of which the Public Utilities Commission will be empowered to work out and administer.

Commission Regulation. Although commission regulation in the modern sense of the term did not begin until 1913, the street railway companies had been subject to regulation by the Interstate Commerce Commission since 1908 with regard to the safety, cleanliness, and convenience of cars, speed of movement, and other features related to the rendering of service. Under the terms of an act of Congress approved May 23 of that year,[46] the Interstate Commerce Commission created the District Electric Railway Commission to assist it in exercising these regulatory powers, this Commission having the status of a bureau of the Interstate body. That these regulatory activities were not particularly successful is indicated by the recurrence in the reports of the Interstate Commerce Commission of the recommendation that Congress vest supervision over street railway service in a new commission or body which would be more closely identified with the District of Columbia.[47] This Electric Railway Commission, however, is of significance in this study since the present Public Utilities Commission is a direct descendant of it.[48]

The Public Utilities Commission created by the 1913 organic act was, and is today, the usual mandatory type modelled after the pioneer Wisconsin and New York Commissions, with continuing powers over the rates, service, capitalization, and accounts of street railway companies, as well as other utilities. It is sufficient here to consider briefly those phases of commission

[44] See *Evening Star*, February 22, 1931.

[45] This provision preventing the Commission from enforcing its meter order was retained in the 1934 Appropriations Act passed March 3, 1933, and in the 1935 Budget presented to Congress in January, 1934. See *Evening Star*, January 7, 1932; April 11, 1932; April 14, 1932; March 3, 1933; and January 4, 1934.

[46] 35 U. S. Stats. 250.

[47] See 1st *Report of I. C. C. on Street Railroads in the District of Columbia*, House Document 1336, 60th Congress, 2nd Session, January 18, 1909; 2nd *Report*, etc., House Document 587, 61st Congress, 2nd Session, January 24, 1910; 5th *Report*, Senate Document 1068, 62nd Congress, 3rd Session, February 10, 1913; *22nd Annual Report of I. C. C.*, 1908, p. 95; and *Report on Archives of the I. C. C.* made September 1, 1908, to the Bureau of Education. There was some question up to December 8, 1923, as to whether or not the I. C. C. had jurisdiction over the depreciation charges of the Washington Railway & Electric Co. The I. C. C. on that date held that it had no such jurisdiction. (12th *Annual Report*, Public Utilities Commission, 1924, pp. 2, 43-46.)

[48] The law creating the new Public Utilities Commission specifically provided for the continuity of its activities with those exercised under the supervision of the I. C. C. See Par. 96 of the law (note 35, *supra*). Mr. H. C. Eddy, executive officer of the Electric Railway Commission, was appointed Engineer in charge of the Bureau of Transit and Equipment Inspection in the new Public Utilities Commission. (See 1st *Annual Report*, Public Utilities Commission, 1913, p. 7.)

regulation in the District which have had a direct bearing upon the transportation problem and attempted solutions of those problems.

Any careful study of the orders of the Commission and its attempts to enforce these orders will bring the conclusion that, in general, the Commission has shown a high degree of honesty, forcefulness, and familiarity with sound principles of public utility economics and regulation. That its efforts have not been attended with greater success has been the result of its inability to carry its orders into effect. This has been attributable, in the first place, to the appeal provisions of the 1913 Act which make possible appeals to the Supreme Court of the District of Columbia of any order or decision of the Commission, thus making the Court virtually a second utilities commission,[49] and, secondly, to the tendency of Congress to obstruct the Commission through the passage of such laws as that which prevented the administrative body from enforcing its 1931 order requiring meters in taxicabs. As pointed out in the preceding section, Congress has usually tended to pursue a hands-off policy and allowed the Commission to regulate as it saw fit. If, however, the above example of Congressional interference becomes a precedent for future Congressional action, effective, continuous regulation of transportation and other utilities in the District will be hampered severely. Neither can satisfactory regulation be provided without amending the organic act in such a way as to limit appeals from Commission orders to questions of law rather than of fact.[50] If the Commission can be assured a reasonable degree of independence, there is every reason to believe that it can be a more potent factor in working out a satisfactory solution of the perplexing local transportation problems. This is particularly true if the various citizens' associations and other civic interests, through some such central agency as the Citizens Joint Transportation Committee, which was largely responsible for bringing an end to the long-drawn-out merger controversy,[51] continues to work coherently and systematically with the Commission in solving the District's transportation difficulties.

Possible solutions of the local transportation problems of the District will be considered by the author in future issues of the *Journal*. Special attention will be given to the contributions which the unification of the transit companies, changes in fares, and regulation of taxicabs may make toward the attainment of the goal of high standards of service and reasonable rates.

[49] The most noteworthy instances in recent years of court reversal of a Commission order were the July 19 and 22, 1930, decrees of the Supreme Court of the District of Columbia which permitted the traction companies to increase their rates, after the Commission had denied the increase. (See 18th *Annual Report*, Public Utilities Commission, pp. 1, 59-61, 1930.) The appeal provisions are found in Paragraphs 64-68, inclusive, of the organic act (37 U. S. Stats. 974).

[50] The Commission has made strenuous attempts from time to time to secure such an amendment. (See Hearings before the Senate Committee on the District of Columbia on S. 3558, providing for Amendments to the Public Utilities Act, February 18, 1930, 71st Congress, 2nd Session; also *Evening Star*, May 13, 18, and 25, 1933.)

[51] This Committee, a representative body organized under the leadership of the Washington Chamber of Commerce, was formed early in December, 1932, in the attempt to force the merger resolution through Congress. The success which crowned its efforts should stimulate the activities of such voluntary, extra-legal citizens bodies, which are peculiarly essential in the District in view of the inability of the citizens to exercise any control through their votes. The latest example of systematic cooperation between citizens' groups and the Commission on transportation matters is the study of ways of improving street railway and bus service recently inaugurated by the Washington Board of Trade. (See *Evening Star*, February 15, 16, and 17, 1934.)

Real Estate Activity in California

By LEWIS A. MAVERICK*

THIS article is the third of a series on California real estate activity.[1] The new material is taken from the records of Monterey, San Benito, and Sacramento Counties. Detailed charts were presented in the first article for San Francisco and Alameda Counties, and for Los Angeles County in the second, but similar details for the three counties newly studied will not be here presented. Instead, this report will proceed directly to summary charts[2] for all six counties which have now been studied, after a brief resume of the economic history of these three counties to supply the necessary background.

Monterey County

Monterey was the capital of Spanish and of Mexican California, and was from 1846 to 1849 the seat of the American military governor. A book of record in Monterey County was begun under the Mexican Government in 1835 and this book records some deeds of even earlier execution. From that record 1838 appears to have been a dull year, which was followed by several normally active years. The years 1847 and 1848 were dull, but 1849 showed a definite rise in activity. The County was created by the first state legislature in 1850. In that same year the stage line from San Francisco to Los Angeles was opened; its route led through Monterey. In 1852 farming was actively practiced in both the Salinas and Pajaro Valleys. In 1859 the cattle in the County reached their greatest numbers, though subsequent improvements in breeding caused their gross value to increase, despite a decline in numbers as agriculture displaced stock-raising. In 1863 the cattle industry was harmed by a drought. In 1865 Moss Landing was improved and regular water transportation to San Francisco was inaugurated. This stimulated farming, and a railroad line to the north, completed in 1868, further aided the farmers. Wheat was raised for a short time, but it soon gave way to other crops.

San Benito County was cut from the former territory of Monterey County in 1874. The Southern Pacific Railroad was continued to the south in 1886. It

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[1] The prior articles were: "Cycles in Real Estate Activity," 8 *Journal of Land & Public Utility Economics* 191-9 (May, 1932); "Cycles in Real Estate Activity: Los Angeles County," 9 *Ibid.* 52-6 (February, 1933).

[2] A construction chart was employed to derive each of the curves shown on the seven charts here presented. With the exception noted below, each variable was plotted in annual form; with the aid of three-year moving averages, a smoothing line was drawn through the somewhat irregular curve of actual data, eliminating as well as possible the short cycle and the year-by-year irregularities; the smoothing line was then transcribed to the composite chart of the several counties and is shown here. The construction charts for Chart V were made in slightly different fashion: the data were plotted in monthly form and two stages of smoothing were employed; in the first stage, with the aid of 12-months moving averages, a smoothing curve of intermediate character was secured, freed from seasonal movements, but still containing the short cycle and year-by-year irregularities; this curve was smoothed again before transcribing to Chart V. All curves here shown are homogeneous (i.e., of the same order), and present to the eye a combination of trend and major cycle which has been freed from seasonal and short-cycle movements.

For further exposition of this graphical method of studying time series, the reader is referred to the author's article, "Time Series, Their Analysis by Successive Smoothings," *Econometrica*, July, 1933, pp. 238-46.

will be remembered that 1887 was the year of the great real estate boom in Los Angeles, based in part upon a railroad rate-war between the Southern Pacific and the Santa Fe. In 1888 Monterey County sold bonds in order to build highway bridges over the Salinas River. In 1888 there was a drought. In 1897 a great sugar refinery was established in Monterey County, and the sugar beet became a staple crop. The San Francisco earthquake of 1906 was sharply felt in this area. In 1907 coal was mined at Coalinga. Subdividing activity occurred at the resort of Carmel and along the peninsula in 1906-9, and again in the 1920's. The lettuce crop has had a great growth since 1922.

The agricultural and stock-raising activities of Monterey County yield the following products: lettuce, beans, seed growing, grain, pears, garden truck, sugar beets, dairying, beef cattle, and poultry. Fishing has been of commercial importance since about 1910. The industries are sugar refining, milk condensing, and vegetable and fruit canning and packing.

San Benito County

San Benito County is a rural area, affected by the same developments as its neighbor, Monterey County. It lies on a branch line of the Southern Pacific and does not touch navigable water. Its products include fruit, hay and grain, seeds, cattle, sheep, and poultry. The coal deposits of Monterey County extend into San Benito County. Industrial activity embraces only canning and fruit-packing.

Sacramento County

Sacramento County was the active center of the gold rush. Gold was discovered at Sutter's Mill at Coloma, a short distance from the present city of Sacramento, in 1848. Speculation in shares centered in San Francisco, but Sacramento was the center of prospecting and mining. The boom was waning, however, by the 1860's when the records for this study begin.

In 1854 the state capital was established in Sacramento. In 1869 the present state capitol building was first occupied; the building was finally completed in 1874.

In 1856 a short railroad was built to Folsom. In 1861 the telegraph line was completed to the East. In the same year great railroad promotion and building began, culminating in the dramatic ceremony of 1869 at Promontory Point, Utah, when the transcontinental Central Pacific-Union Pacific railroad was completed. In 1869-71 construction rivalry and a rate war between the Central Pacific and the California Pacific occurred. Since the '70's, railroad shops have been located in Sacramento. In the Pullman strike of 1894 Sacramento was an important center. In 1910 the Western Pacific was completed.

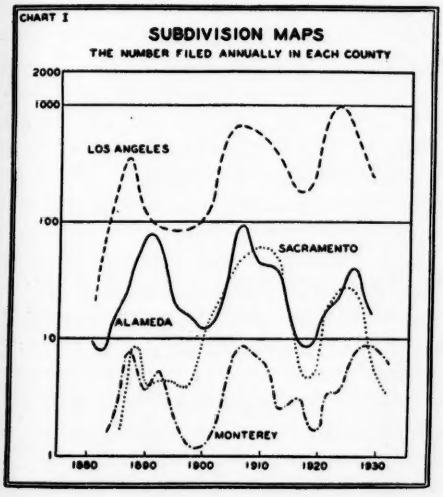
During the '50's, breweries were established, also a boiler shop, broom factories, and a number of wagon and carriage shops. In the same period wheat became an important crop, and a number of flour mills were established. By 1880 California was the leading wheat-producing state of the Union. From that date, however, wheat has declined because of the competition of other crops.

The Summary Charts

Charts I, II, III, and IV depict the history of subdivision activity. These show the records of four counties only, as the count of maps was not made for San Francisco County, and the San Benito County figures were too small to be significant. To make the figures for the several counties comparable, the Alameda County subdivisions have been

recalculated on the basis of the number of maps filed, rather than the number of lots on those maps, in which form they were presented in the first article.

Chart I, the count of subdivision maps, shows for the four counties a substantial agreement in the cyclical movement—namely, a peak in activity at or just before 1890; a period of inactivity through the 1890's and especially in the later years of that decade; activity 1904 to 1911, and for Sacramento County an even earlier beginning of this activity, in about 1900; inactivity during American participation in the World War; and activity 1923 to 1926, save that the active period in Monterey County was later both in its beginning and ending. The major cycle is roughly 18 years in length. In the late 1920's Sacramento County seems to have felt the depression most severely, while Monterey



County felt it least. The trends which one may imagine drawn for the four counties would be less uniform than the cycles. These trends indicate that the number of maps filed annually in Los Angeles County have tended to increase from about 100 to 600. The Alameda County figure declined from about 30 to 20. The Sacramento County figure rose from 6 to 20 but declined again to 10. The Monterey County figure rose from about 2 to 5. In the effort to determine whether there is a stability or uniformity underlying these trends—i.e., whether some basic principle governs the filing of subdivision maps—Charts II and III have been prepared, converting the figures from Chart I to per-capita bases.

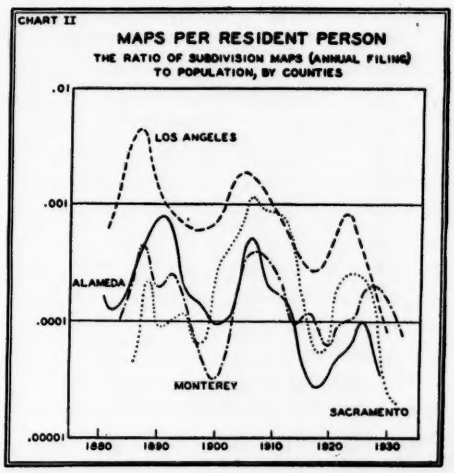
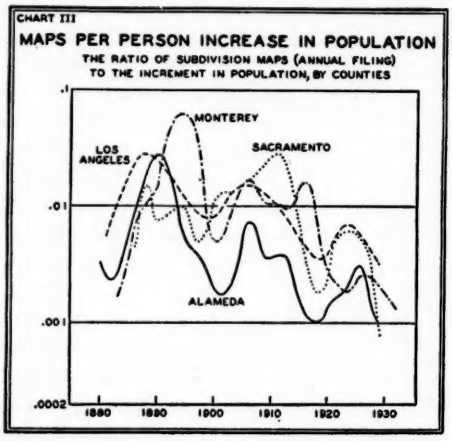


Chart II shows the ratio of maps to population, that is, the number of subdivision maps filed annually per capita. Here the cycles are almost the same in timing and amplitude as on Chart I. The trends, however, would here be more nearly uniform. They would show a general subsiding, leading toward a present figure of roughly one map per year for each 10,000 of population.

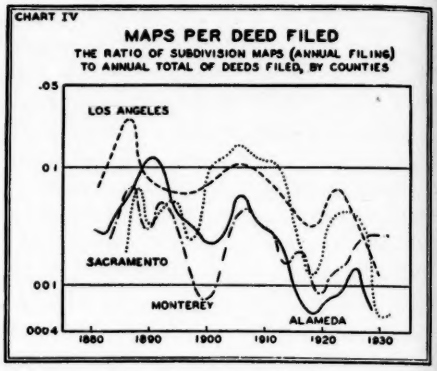
On Chart III, the ratio of maps to the increment in population, there is not the same agreement among the counties as to the cycle. Possibly a finding of real significance is here indicated, that the relationship between gross population and subdividing activity is closer than is that between population increment

and subdividing activity. On the other hand, the irregularities on Chart III are attributable in part to the fact that the estimates of population increment are of necessity inaccurate. The population figures have been obtained by interpolating along a smoothed curve which connects the figures for the census years. Monterey County shows the greatest departure from the standard pattern, particularly in the apparent peaks of



1895 and 1917, but it must be remembered that the figures both for maps and for population increment in Monterey County are very small. The four trends would be more homogeneous than the cyclical movements, declining from about 10 maps per 1,000 new citizens in 1880 to about 2 per 1,000 in 1930. Both Chart II and Chart III bring the divergent figures of Chart I to homogeneity as to basic trends.

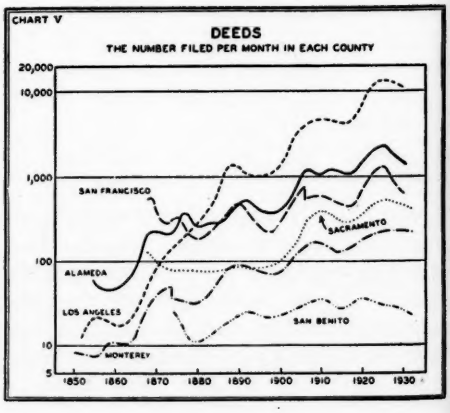
Chart IV shows the ratio of subdivision maps filed to deeds filed. The cycles are similar to those on Charts I and II, which means that the cycles on Chart I (maps) are similar in timing to, but more violent than, those on Chart V (deeds). The petty deviations from the common pattern shown for the two small counties in the years 1887-95 could



with propriety be smoothed out. The trend lines would reveal an underlying homogeneity, the figure declining from a value of about 10 maps per 1,000 deeds in 1880 to 1.5 per 1,000 in 1930.

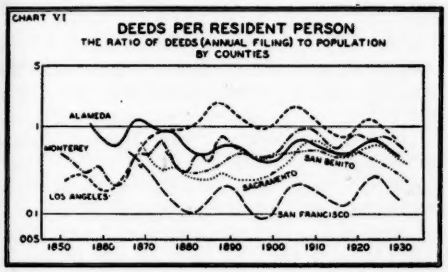
Charts V, VI, and VII show the number of deeds filed for all six counties.

Chart V is based upon deeds per month, and, as explained in footnote 2 (p.291), is composed of curves each of which has been smoothed twice from quarterly figures. On Chart V the curves for the six counties show a definite agreement as to the cycle: activity in 1870-73 (save for Sacramento County which was declining from its early bonanza days); dullness in 1880; activity in 1890; dullness in the late '90's; activity in 1906 and 1907 (the San Francisco earthquake occurred in



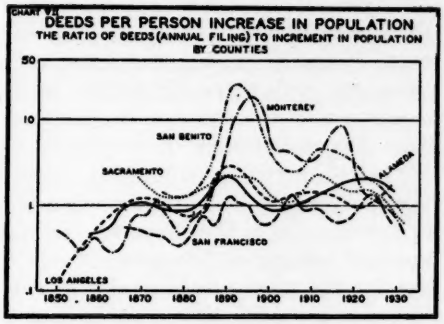
April, 1906); dullness in 1917; activity 1923-25, and a subsequent subsiding. The major cycle is roughly 17 years in length, and is more moderate in amplitude than is the fluctuation in subdivision maps (Chart I). The six trends would be alike in type, though they would differ in slope. Activity in Los Angeles County shows the greatest increase; it rises steadily from about 10 deeds per month in 1850 to 15,000 in 1930, following an "S" curve of the logistic or Gompertz type. Monterey County shows a similar though more moderate rise, from about 7 per month to 200; San Francisco County from about 200 to 1,000; Alameda County from 50 to 2,000; Sacramento County from 100 to 800; San Benito County from about 15 in 1875 to 35.

Chart VI, which shows the ratio of deeds to population, is homogeneous for the several counties. San Francisco



County has been low, with a figure of about 2 per 100 residents and Los Angeles County has been high with 10 per 100. But the chart shows that these two are converging toward an intermediate figure of about 6 per 100 of the population per year. San Francisco and Alameda Counties were high in their early boom days (probably Sacramento was also), and Los Angeles County was low in the placid days prior to the coming of the railroads.

For Chart VII, which presents the ratio of deeds to population increment, the same apology for unavoidable inaccuracy of estimate must be offered as for Chart III. If a consolidated curve should be drawn for the six counties, it would show a rise from an early figure (1860) of about ½ deed per year for each new person in the community to a maximum



in 1890 of 3 deeds per year for each new person, the figure subsiding again and tending toward one deed per year per new person. Save for the small counties of Monterey and San Benito, the 1890 high figure would stand at about 2.

Conclusion

In respect to the uncorrected counts of maps and deeds filed each year, as well as to these counts after they have been reduced to per-capita bases (the reference is to aggregate population), remarkable homogeneity obtains among these six dissimilar and remote counties, and all the counties reveal a clear 17- or 18-year cycle. The number of maps filed shows a more vigorous fluctuation from trend than does the number of deeds. The per-capita charts (II and VI) tend toward stable figures, fairly uniform in the several counties, one map and 600 deeds per 10,000 population per year. The ratios to population increment (Charts III and VII) tend toward 20 maps and 10,000 deeds per year per 10,000 new residents.

Recent Developments in the Control of Public Utilities in the State of Washington

By JAMES K. HALL

THE enactment of the District Power Law by the electorate in the general election in November, 1930, may be regarded as the first of a series of highly important changes in the character and scope of public utility regulation in the State of Washington. The District Power Law authorized the establishment of municipal corporations, known as public utility districts, in any section of the State for the purpose of owning and operating electric power, irrigation, and domestic water systems in order to conserve and to utilize the water and power resources in the interests of the public.[1] This enabling legislation has not as yet been utilized for the formation of public utility districts within the State. However, definite interest has been manifested in certain rural sections. The explanation for the failure of rural residents to use this enabling legislation apparently lies in financing difficulties, in rate reductions which have been made by the private companies to rural residents since 1929, in the policy of the Washington State Grange which is to proceed slowly and avoid mistakes, and in this enabling legislation not becoming effective until November, 1932. Badly depressed prices for agricultural commodities, the increased relative weight of the tax burden, and more or less reluctance to remove additional property from the tax rolls also have exerted some influence. The period of little more than a year during which the act has been effective is, in itself, too short an interval in which to judge the response of the rural districts to this legislation. That it has had a salutary effect on the private electrical utilities in their treatment of rural consumers appears to be undoubted.

The overwhelming Democratic victory in Washington in 1932 placed in office Governor Clarence D. Martin, who, in his inaugural message to the Legislature, indicated his desire for a changed state utility regulatory policy in these words:

"It is recommended to your Honorable Bodies that you formulate and proclaim a new policy for the Department of Public Works. The present practice is to wait until the consumers complain, hold an investigation and then sit as a judicial tribunal. My belief is that the Department of Public Works should be charged by law with the specific duty of representing and protecting the public, and to move on its own initiative to prevent inflation of rate-making valuations and to forestall unfair rates for power, light, telephone service and transportation. Moreover, it is advisable, especially in view of economic readjustment and lower commodity costs, that the Department of Public Works be required to immediately move for a downward revision of utility rates, and it is essential that the Legislature provides reasonable funds for investigations to determine proper valuations to insure an intelligent and equitable revision of utility rates.

"The Department of Public Works should be given control over corporate capitalizations."

Among Governor Martin's first appointments was that of Mr. E. K. Murray as Director of the Department

[1] For a discussion of the District Power Law see Hall, J. K., "Washington's Public Ownership District Power Law," 20 *National Municipal Review* 342-48 (June, 1931).

of Public Works. The new Director's primary interests upon assuming office were to sponsor the legislative passage of a series of new regulatory laws designed to expand the authority of the Department and to secure a comparatively large appropriation for use during the biennium. A large measure of success attended the Director's efforts in both respects. The Legislature appropriated a total of $430,850 of which $250,000 was for special utility investigations and valuations as compared with a total appropriation of $272,000 for the preceding biennium (1931-33) which did not include any outlay for special investigatory purposes. From a fiscal point of view, the reorganized Department had an auspicious beginning.

The new regulatory laws proposed by the Department and passed by the Legislature are of sufficient importance to justify individual treatment. It may be said that the amended and supplemented utility law in Washington now compares favorably with that of any other state, and failure in the future to control adequately the public utilities in Washington may be placed on the administrative agency rather than on insufficient and restricted statutory authority.

Five important acts passed by the 1933 session of the Washington Legislature will be distinguished and briefly summarized.

Refunds of Overcharge

An act relating to "Refunds of Overcharge by Public Service Companies"[2] amended existing public service law with the objective of avoiding duplicate trials in refund cases and thus diminishing the time involved in litigation and its attendant costs. The statute, in part, provides that

> "If the order of the department shall be found to be contrary to law or erroneous by reason of the rejection of testimony properly offered, the court shall remand the cause to the department with instructions to receive the testimony so proffered and rejected and enter a new order based upon the evidence theretofore taken and such as it is directed to receive. The court may in its discretion remand any cause which is reversed by it to the commission [department] for further action . . .
>
> "The *procedure provided in this section is exclusive*, and neither the supreme court nor any superior court shall have jurisdiction of orders of the department determining overcharges and/or reparation save in the manner hereinbefore provided." (Author's italics.)

The statutory provision which had heretofore permitted a deduction of a fee of 10% from refunds collected to be paid into the State public service revolving fund was repealed[3] as were certain other sections.[4]

Securities Regulation

The importance and necessity of adequate regulation of public utility securities found expression in the enactment of a statute "providing for the supervision, regulation, restriction and control of the issuance of securites."[5] This act[6] supplemented existing public service law which had been defective, as no statutory authority was given the

[2] Chapter 148, 1933 Session Laws of Washington.

[3] Section 10436, Remington's Compiled Statutes of Washington.

[4] Sections 10434, 10435, 10437 and 10438, Remington's Compiled Statutes of Washington.

[5] Chapter 151, 1933 Session Laws of Washington.

[6] This Act, with the exception of section 1, parts of sections 4, 10, and 11, and sections 15 and 16, is essentially a verbatim reproduction of the California securities control act.

See General Laws of California, 1931, Deering's Code, Act 6386, sections 52 (a), (b), (c), (d), (e), (f), (g) and (h), and 52½.

See also Wisconsin Laws, 1931, sections 184.01 to 184.14, especially sections 184.02, 184.05, 184.06 and 184.08, and Cahill's Consolidated Laws of New York, 1930, Chapter 49, section 69.

Department of Public Works to control public utility securities, capitalizations, and corporate structures.

The new security act provides that the issuance of securities by public utilities is a special privilege which can be exercised only in conformity with the law of the State and is subject to the supervision of the Department of Public Works except in the case of common carrier railroads and other utilities, the securities of which are subject to regulation by the Interstate Commerce Commission. Securities maturing more than 12 months after date of issuance may be used only for certain legitimate purposes as enumerated in the statute. In applying for authorization to issue securities, public utilities must supply information as to the amount, character, terms, and purpose of the proposed issue. Additional data may be required and/or hearings may be held by the Department[7] which may grant or deny the application or allow the issue in some lesser amount. Provision is made in the case of corporations under other regulatory commissions for the issuance of a joint certificate of approval of security issues by an interstate utility. Proceeds from the sale of approved security issues may be used only for the purpose specified and only in the amount authorized. Notes with a maturity of not more than 12 months may be issued by utilities for proper purposes without the approval of the Department. No contract, franchise, permit, or corporate right can be capitalized in excess of the amount actually paid to the State or political subdivision thereof with any tax or annual charge excluded therefrom. Securities issued without authorization, or not conforming in substance to the administrative order, or issued upon the authority of articles of incorporation (after the act becomes effective) without the sanction of the Department are void. A condition precedent to incurring any obligation or liability as a guarantor or surety of the securities of any person or corporation having a maturity in excess of one year is the express authorization of the Department. Penalties are provided by making it a gross misdemeanor for agents or employees of the utility to aid or to act in violation of the statute and by subjecting offending corporations to a penalty of not to exceed a thousand dollars for each separate offense.

The new security act is sufficiently broad and inclusive in scope to give the Department substantial authority over security issues of public utilities. Failure to secure effective regulation in this regard will be administrative rather than statutory. An important forward step in utility regulation has been taken which is in the interest of better balanced and more conservative utility capital structures, and in the interest also of utility investors and the consuming public.

Regulation of Holding Company Relations

As in the case of the new security control act, the need for statutory authority to control the relationships and practices of management holding companies and other affiliated interests resulted in an enactment providing for their supervision and regulation by the Department. The law[8] defines an affiliated interest as every person or corporation holding directly or indirectly, in a chain of successive ownership, 5% or more of the voting securi-

[7] The word "Department" refers to the Department of Public Works of Washington.

[8] Chapter 152, 1933 Session Laws of Washington. This act is a close adaptation of the Wisconsin law regulating the relations of public utilities with affiliated interests. See Wisconsin Laws, 1931, section 196.52.

ties of any public service company engaged in intrastate business in Washington; every person or corporation having a utility management or service contract; and every person "who is an officer or director of such public service company or of any corporation in any chain of successive ownership of five per centum or more of voting securities."

Contracts or arrangements between affiliated interests and public service companies providing for the furnishing of management, engineering, legal, accounting, financial, and like services or service and/or property are without effect until the sanction of the Department has been given thereto. Verified copies or summaries of all written and unwritten contracts between affiliated interests and utilities must be filed with the Department. These contracts or arrangements are not to be approved unless consistent with the public interest. Satisfactory evidence as to the cost of furnishing the above services or property may be required. In proceedings before the Department, payments under existing contracts to affiliated interests may be excluded in whole or in part unless the utility can establish the reasonableness of such compensation. Satisfactory evidence within the meaning of the act includes the original or verified cost records properly authenticated. The control of the Department over contracts shall be continuous. Initial approval of a contract shall not preclude subsequent disallowance or disapproval of payments if actual experience reveals their unreasonableness. This authority is expressly reserved. If upon investigation the Department finds that any utility is giving effect to, or making payments under an unauthorized or disapproved affiliate contract, a summary order may be issued "prohibiting the public service company from treating any payments made under the terms of such contract or arrangement as operating expenses or as capital expenditures for rate or valuation purposes, unless and until such payments shall have received the approval of the department."

The establishment of authority adequate to control the relations between intrastate operating utilities and affiliates is salutary and in the public interest. It is to be hoped that effective administration of this addition to the public service law will be forthcoming. There has been a decided public reaction to the abuses of certain management holding companies in Washington as elsewhere.[9] The Department has now been placed in a position to act and to act in an effective fashion.

The Omnibus Statute

To meet further the problem of inadequate statutory authority, another general act was passed.[10] This "omnibus" law amended and supplemented existing public utility law in many respects. Certain of its features are of special importance.

Some doubt had existed as to whether the Department could regulate for redistribution the sale of bulk and/or surplus power, gas, and water sold to municipalities and to manufacturing or industrial concerns. The law clarifies the situation. The Department now clearly possesses the necessary authority and is empowered to terminate or revise all contracts relating to the disposal of power, gas, and water in wholesale quantities at its discretion.

[9] See Senate Document 92, 70th Congress, 1st Session, Part 29 (Investigation of the Washington Water Power Company); also Part 35 (Investigation of the Pacific Power and Light Company, Northwestern Electric Company, Inland Power and Light Company, and the Idaho Power Company).

[10] Chapter 165, 1933 Session Laws of Washington.

Accounts, records, and other documentary materials (or certified copies thereof) must be produced at the order of the Department for its examination without the requirement of a hearing.

Proposed changes in rates, classifications, rules, or regulations by utilities may now be suspended by the Department for a maximum period of seven months pending a hearing and decision instead of for five months as heretofore obtained, bringing the Washington law in conformity with the Interstate Commerce Act.[11] At hearings involving increased rates, the burden of proof to show the reasonableness thereof is placed by statute upon the utility. This section of the act could be further improved by adding, in substance, the Wisconsin provision which places the burden of proof "upon the party adverse to such commission or seeking to set aside *any* (author's italics) determination, requirement, direction or order of said commission, to show by clear and satisfactory evidence that the determination, requirement, direction, or order of the commission complained of is unreasonable or unlawful."[12]

Valuation. Under the old law the Department, apparently, was required by statute to use prudent investment as the basis of valuation for rate purposes.[13] The Department up to this time has regarded the prudent investment doctrine as being sound and desirable. The new act in amending the section on valuation simply provides that the Department is to "determine the fair value for rate making purposes of the property . . . used and useful for service in this state," thus leaving the basis or bases of valuation to be used to the discretion of the Department and the judgment of the courts. The recently appointed Director of the Department who sponsored this amending legislation is aggressively applying reproduction cost in valuation proceedings, presumably with the purpose (and as a means) of substantially reducing utility rate-bases and hence utility rates. Prudent investment has thus been discarded, at least temporarily, as the controlling measure of rate-base value.

Appliance Merchandising. Another section of the omnibus law provides that a public utility "engaging in the sale of merchandise or appliances or equipment shall keep separate accounts, as prescribed by the department, of its capital employed in such business and of its revenues therefrom and operating expenses thereof." Furthermore, merchandising capital, expense, and income are not to enter into the rate-base or operating expense and income of the company as a public service corporation.

Public utilities no longer are to permit employees to sell or to solicit the purchase of securities of any other person or corporation during hours of em-

[11] I. C. C. Act, section 15, subsection (7).

[12] Wisconsin Laws, 1929, section 196.46, p. 974.

[13] The Supreme Court of Washington in dealing with the question of utility valuation under the old law said:

"The first of the questions in controversy is whether the department, in ascertaining the values of the several properties involved, on which it based its schedule of permissible charges, pursued a proper method of valuation. The method adopted by the department is what is commonly termed the prudent investment method. The department ascertained the sums of money prudently invested by the owners in the properties, and, using the sums so found as a rate base, formulated a schedule of charges which, based on the normal amount of business transacted, would yield to the owner a sum slightly in excess of ten per centum on the investment. The method pursued by the department was the method which we approved in *State ex rel. Spokane v. Kuykendall*, 119 Wash. 107, 205 Pac. 3 [1922]. We there pointed out that this was not only the method of ascertaining the value of property for rate making purposes uniformly pursued by the department in its former practices, but was the method required by the statute under which the department derived its powers." *Pacific Coast Elevator Co. v. Department of Public Works*, 130 Wash. 632 (1924).

ployment, nor to require, directly or indirectly, the purchase of their securities or those of other persons or corporations of employees or deductions from salaries and wages in fulfillment of security installment purchase contracts.[14] It is the purpose of this section of the act to eliminate certain abuses in connection with the pressure sale of utility securities to employees.

Budget Control. An important section of the act, the budget control measure, provides that the Department shall have the right and power to examine and to approve or to reject items of proposed expenditure in the budgets of utilities which must be filed at the order of the Department. It was said by the Director of the Department that utility representatives in Washington were more concerned over this section than over any other regulatory measure before the Legislature. The utilities, according to the Director, offered to accept the other proposed legislation without protest, providing this section were dropped. The Director refused. In consequence, opposition to the budget control provision particularly, and to the regulatory legislation generally, was forthcoming.

Utilities are to prepare and to file budgets with the Department by the first of November of each year. These budgets are to show the amount of money which in the judgment of the utility managements "will be needed during the ensuing year for maintenance, operation and construction, classified by accounts as prescribed by the department," which, upon investigation, shall approve or reject, in part or in whole, the items therein. By filing supplemental budgets from time to time during the year, likewise subject to the approval of the Department, adjustments can be made as conditions and circumstances warrant. Utilities may make rejected items of budget expenditure (at their option) subject to the penalty of non-allowance as an operating expense or as an item to be included in the rate-base as the case may be. Provision is made for the subsequent allowance of rejected items of capital outlay in the rate-base by the Department if later found to be used and useful. In the case of necessary expenditures to meet substantial service emergencies, utilities may act free of the restraints of this section.

The budget control section injects a large element of *realism* in utility regulation. It may be regarded as an attempt to exercise badly needed regulatory foresight; to take preventive steps in financial control before financial ills are contracted and are history; and to act in the interest of vital but elementary economic planning. All too often the regulatory process has been characterized by futile efforts to control after the proverbial horse has been stolen. While commission budgetary supervision involves direct control over certain of the discretionary acts of management and, in a sense, means some public performance of the management function long regarded as exclusively private, it is hardly to be expected that this control will affect utility managements deleteriously as has been asserted. Sound budgetary control of public utilities may be regarded as a long forward step toward more effective regulation.

Dividend Payments. To insure that dividend payments by utilities operating in Washington would henceforth not prejudice their financial position, a section of the act provides that divi-

[14] This section is essentially a verbatim reproduction of section 8, No. 232 of the General Laws of Alabama, Extra Session, 1932.

dends on common stock may not be paid until certain conditions are met.[15] First, earnings and earned surplus must be sufficient to meet the dividends declared and the requirements of adequate and proper reserves which are to constitute a prior charge. Second, the payment of the proposed dividends must not impair the obligation of the utility to render adequate service at reasonable rates. As a condition precedent to the payment of dividends, application must be made to the Department for approval. If the Department disapproves the proposed dividend payment, no such disbursement may be made until its order has been vacated. Should the Department find that the capital of a public utility has been impaired, an order may be issued after investigation and hearing "directing such company to cease paying dividends on its common stock until reasonable proof has been made to the department that such impairment has been made good."

Costs of Regulation. Another section of importance in the omnibus act relates to the assessment of costs of investigating "the books, accounts, practices and activities," of performing "any valuation or appraisal of the property," and of rendering "any engineering or accounting service to or in connection with any public service company."[16] These costs may be charged to the utility or utilities in question subject to the limits of reasonableness as found by the Department. This is a departure from the Wisconsin law which establishes an annual statutory maximum of ⅛ of 1% of the gross operating revenues derived from intrastate operations in the last preceding calendar year as the limit of costs which may be specially assessed.[17] Failure on the part of utilities to pay the amounts assessed within 30 days of notice results in a delinquency penalty in the form of a 6% interest charge. The attorney-general of the State is empowered and directed to institute proper legal proceedings to collect the delinquent payments with interest and costs.

The significance of the foregoing section should not be underestimated. Adequate finances are vital and basic to the successful functioning of any regulatory body. One of the principal causes of the failure of regulatory bodies to regulate is found in their inadequate financing. Legislative groups, unfortunately, have followed generally the policy of parsimony rather than economy in their appropriations for the performance of the regulatory function. The policy of assessing regulatory costs on utilities, while open to some objections, nevertheless provides a quantum of necessary commission support. The advantages of meeting the costs of regulation from general and special fees on utilities far outweigh the disadvantages. The importance of separating commission finances from the general tax fund and the politics associated therewith is beginning to be appreciated. A general fee of 1/10 of 1% of the gross operating revenues of utilities in Washington has been an important source of income to the Department. This revenue which may now be supplemented by special charges, as above, will give the Department a substantial amount of income, which, if fully appropriated by the Legislature for the use of the Department, should provide reasonably ample support.

[15] This section is based upon sections 6 and 7, No. 232 of the General Laws of Alabama, Extra Session, 1932.

[16] This section is apparently an adaptation of section 196.85, Wisconsin Laws, 1931.

[17] See Wisconsin Laws, 1933, section 196.85.

Depreciation. The need for more effective control over depreciation policies and accounts of utilities found expression in the depreciation section of the act.[18] The Department is now empowered by a statute to establish the rules, regulations, and forms of depreciation and/or retirement accounting, and to fix by order proper rates of depreciation for the several classes of utility property. Funds credited to depreciation and/or retirement reserves and income from investments of such accounts may be used only for covering the loss in asset values in accordance with the rules and regulations prescribed by the Department. Consideration may be given to depreciation rates and reserves heretofore followed by utilities in fixing rates for the future. The Department is given like authority over all other reserve accounts.

It is earnestly to be hoped that the Department in interpreting and applying the above section prescribes a sound system of depreciation accounting as distinguished from retirement or renewal accounting. Some of the utilities in Washington, as elsewhere, have established a system of retirement and/or renewal reserves to meet the retirement of assets at the expiration of useful life. This "backward looking" method of covering the loss of asset service life is not in the public interest nor in the interest of the utilities themselves. Prompt retirement of assets at the expiration of their economic service lives is not always secured; in fact, the tendency is for undue and uneconomic prolongation. Furthermore, the rapidity and time of retirements are conditioned, to a considerable extent, by the amount of corporate income available for this purpose; also the expired capital outlay caused by the factor of depreciation is never fully covered which means financial impairment of the investment to the detriment, particularly, of the holders of the corporate equity. In the use of theoretical depreciation (a "forward looking" policy), utilities can maintain fully the financial integrity of the investment and be prepared to meet with less strain the effects of functional depreciation and to maintain the requisite high quality service at constantly lower rates. Professor Eliot Jones has properly said, "in few businesses is depreciation as important as it is in the public utility industry,"[19] a fact which some utility managements, unfortunately, have failed to understand and to appreciate.

Reserve Funds. The last important section of the omnibus act deals with the placement of earnings "in excess of a reasonable rate of return upon the fair value of its [utility's] property used and useful" in a reserve fund which, subject to the rules and regulations of the Department and at its order, may be applied in meeting deficiencies in a fair return, in establishing and maintaining depreciation, amortization and/or other funds, and in other uses beneficial to the consuming public.

The provision conforms in substance to the "dividend reserve" recommendation of Professor Eliot Jones. He proposed that a public service company "should be allowed to retain the . . . excess above a fair return, but that it should be placed in a reserve, dividend or other, against the lean years of the future."[20] He adds that "the establishment of such a reserve will be helpful to

[18] This section is largely a verbatim reproduction of section 49, Act 6386, General Laws of California, 1931 (Deering's Code).

[19] Jones, Eliot and Bigham, T. C., *Principles of Public Utilities* (New York: Macmillan Company, 1931), p. 466.

[20] *Ibid.*, pp. 264-5.

the company, as it will tend to assure the regular payment of dividends."[21] There are other distinct advantages to the utilities and to the public of this method of handling the excess above a reasonable return of which Professor Jones is not unmindful. It may be said, however, that unless utility rate-bases and rates of return are definitely determined for each utility for each earning period the excess return cannot be effectively measured. For the section to be practical of application, close, rigid, and continuing accounting control of utilities by the Department is necessary. Under past and present methods of regulation this provision would be largely without significance. Unless the section is disregarded completely it will serve one desirable purpose at least, that of more effective supervision and control of utility accounts.

Municipal Utilities

Another important act passed by the Washington Legislature, the last to which reference will be made, is a measure sponsored by United States Senator Homer T. Bone, who has long been an ardent proponent of public ownership and operation of public utilities. This enabling act permits municipalities owning electric light and power plants to sell electricity *outside their corporate limits* to any municipality, public utility district, governmental agency, mutual association, person, firm or corporation, or to purchase therefrom; to construct, purchase, condemn, and purchase, and to operate distribution systems and /or transmission lines outside their corporate limits for the purposes of selling or purchasing electricity and /or interconnecting their plants with other plants or systems; and to exercise the right of eminent domain to effectuate the foregoing purposes.[22] However, the act provides that no publicly or privately owned electric system in any other municipality is to be acquired except with the approval of a majority of the qualified electors therein. Furthermore, no municipality shall condemn and purchase any electric plant, system, or part thereof, owned or operated by any municipality, mutual, non-profit, or cooperative association, or public utility district.

This legislative measure was in response to a considerable agitation in Washington to free municipally owned and operated electric utilities from the confines of their corporate limits in the disposal of surplus power. However, this enactment simply permits by statutory authority an act which had previously been sanctioned and legalized by Supreme Court mandate.[23] The desire on the part of the supporters of utility municipalization to clarify fully the right of municipal systems to sell power outside corporate limits was behind this legislation. The fact that certain municipal electric systems had unutilized or excess capacity, which was to be augmented in the near future, was also a consideration. This need for a larger market could be met, in part, by the expansion of the area within which there would be a legal right to serve. It will be noted that municipal systems are restrained by the statute from *forcing* their way into communities already served. Expansion of the market, except in rural areas served by privately owned utilities, is only by the express consent of those concerned.

The Reorganized Department of Public Works

With the appointment of a new Director of the Department early in 1933 a

[21] *Ibid.*, p. 265.

[22] Chapter 51, 1933 Session Laws of Washington.

[23] *Municipal League of Bremerton v. Tacoma*, 166 Wash. 82 (1931).

new attitude in utility regulation was soon manifest. The technical staff of the Department was quickly reorganized and enlarged. Unfortunately, the Director, though giving consideration to technical qualifications, apparently regarded party affiliations as important in making appointments to the staff. As the selection of an able and competent staff is of the greatest importance in the success of a program of regulation, any defects in this regard will become increasingly apparent. The utilities will not be slow in finding and in taking advantage of weaknesses in administration.

An aggressive effort to revise rates (downward) was quickly undertaken. As stated by Governor Martin:

"Immediately after adjournment of the regular session, the department opened its drive for just and fair utility rates. So far forty-nine cases have been filed, of which forty-eight were filed on the initiative of the department. This includes investigations of five major power companies and two major telephone companies, which are under progress, and a completed investigation for revision of street lighting rates in 150 communities throughout the state. Hearings on these cases will be started in the course of a few weeks.

"So far, the department has issued twelve orders, requiring rate reductions of from 5 to 40 per cent, saving around $400,000 a year for the consumers. In addition, orders are being prepared in fourteen other cases."[24]

It is significant that all but one of the above cases were initiated by the Department. The number of rate reductions evidences the apparent success which has attended these efforts. However, the utilities promptly appealed to the courts for relief. In view of the attitude of the federal courts on utility rate questions, the initial success of the Department may be largely nullified in the process of judicial review.

It is interesting to note in this connection that the Department used company book valuations instead of Departmental appraisals as a basis for rate reductions during its initial period of activity. The purpose, apparently, was to provide immediate rate relief without awaiting the results of the time-consuming and laborious general valuations of the staff then in process. In the Port Angeles rate case, among the first of a series to be instituted, the Department, in its rate reduction order, declared that a rate of return of 4.64% upon the full undepreciated book value of the company's property was a just and reasonable return under present economic conditions.[25]

The large municipally owned and operated electric systems, particularly the Seattle Light Department, have a very direct interest in the state-wide attack on utility rates by the Department. Any reduction in the rates of a private utility where there is direct competition with a municipal utility would force, doubtless, the municipal system to make a corresponding reduction. It is not likely that municipal systems would regard this with favor at the present time. Furthermore, as utility rates are reduced elsewhere, the favorable rate comparisons of the municipally owned systems with private systems in Washington are lessened or, perhaps, will disappear.

In the application of the budget control law to which reference has been made, the Department has challenged numerous items of proposed expense in the utility budgets submitted. In the case of the Puget Sound Power and Light Company and its subsidiaries, the

[24] Message to the Legislature on the occasion of the special session, December 4, 1933.

[25] Washington Department of Public Works, Cause No. 6604, July 10, 1933.

Department objected to expense items totaling $353,967 in the proposed 1934 operating budget.[26] The items are alleged excessive executive and employee salaries, regulatory commission expense, law expense, dues and payments to organizations, transfer agent and supervisory expense, advertising expense, etc. Seemingly, the Department is making a serious effort to control effectively operating expenses of utilities.

Conclusion

In conclusion it should be said that the State of Washington has made substantial forward progress in the statutory control of public utilities since 1930. The new legislation, in large measure, embraces an informed, realistic, and needed plan of control. The attitude of the Department seems frankly experimental as regards the regulatory process. This is to be commended as long as it is intelligent and farsighted, and not unduly and improperly subject to the exigencies of expediency and opportunism. In Washington, as in many states, there has been insufficient realization that a most vital feature of effective regulation is a properly trained and competent personnel. Regulation today is a continuing expert business which, if not recognized, results in spasmodic, ill-informed, and futile experimentation. There has been inadequate appreciation of the importance of the human factor in the regulatory process generally. It is hoped that the public is not so naive as to believe that economic evils can be corrected by the mere existence of a more elaborate statutory code. Statutes must be vitalized by a qualified and effective commission with a public spirit and a public vision.

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[26] *Ibid.*, Cause No. 6690, December 12, 1933; see also Cause No. 6688, December 7, 1933.

Comments on Legislation and Court Decisions

The New Supreme Court Test of Confiscatory Rates

THE Supreme Court handed down two opinions on April 30 in which it substituted a new test of "confiscation" for the conventional "fair return on fair value" of *Smyth* v. *Ames*.[1] In neither opinion did the Court expressly repudiate the older "rule." In fact, each opinion speaks of the new test (that of "actual experience") as if it were merely a check on the accuracy of the computations made under the old. On closer examination, however, it will be seen that the Court is not merely rejecting inaccurate "findings" made by the old method, but the old test itself in so far as it leads to conclusions inconsistent with those found by the new. And, however accurate all the specific "findings," the rule of *Smyth* v. *Ames* would frequently lead to conclusions "glaringly incongruous" (to use the Chief Justice's phrase) with those reached by examining the company's actual experience.

The two cases in which the new approach is utilized are *Lindheimer* v. *Illinois Bell Telephone Co.*[2] and *Dayton Power & Light Co.* v. *Public Utilities Commission*.[3] The former was the last stage in a lengthy course of litigation as to the validity of an order made in 1923 by the Illinois Commerce Commission reducing telephone rates in Chicago. Under protection of an interlocutory injunction, the company had meanwhile charged the old rates, but under the condition that the excess above those fixed by the Commission would be refunded should the injunction be dissolved. The District Court in 1933 had made the injunction permanent, after finding that the Commission's rates would have been confiscatory for each of the years since their promulgation.[4] The Supreme Court found them confiscatory in *none* of those years, reversed the District Court, and ordered the interlocutory injunction to be dissolved and the refunds made. The opinion was written by Chief Justice Hughes. Mr. Justice Butler wrote a concurring opinion, in which he took issue with nothing said by the majority, and discussed only the question of the depreciation allowances. The ruling on that point, he felt, "is so important that, even at the risk of duplication, emphasis should be laid upon some facts and reasons that may be cited in its support."

The Court's conclusion that the Commission's rates were adequate each year to avoid confiscation is derived from three premises. Two of these raised important issues which the opinion discusses; a third was undisputed. The premises were these: (1) The old rates were non-confiscatory (It was in establishing this premise that the traditional approach was discarded.); (2) The net earnings were some $1,800,000 per year greater than they seemed, because at least that much of what the company charged to depreciation was unnecessary for that purpose, and had been used to acquire new property (The greater part of the opinion is devoted to the grounds for this premise.); (3) The Com-

[1] 169 U. S. 466 (1898).
[2] 54 Sup. Ct. 658.
[3] 54 Sup. Ct. 647.

[4] *Illinois Bell Tel. Co. v. Gilbert*, 3 F. Supp. 595 (1933). The District Court was composed of Evans and Sparks, Circuit Judges, and Wilkerson, District Judge. The opinion was *per curiam*.

mission's order would in none of the years have caused the earnings to be reduced by more than $1,740,000. (There was no dispute as to the amount of the reductions.)

Some of the language gives the impression that the Court considered the premises in this form sufficient to prove the adequacy of the Commission's rates; that it regarded the reduction of the depreciation charges as having the effect of adding $1,800,000 to the amount available for return, with the result that the return under the reduced rates would be as great as that under the old ones. This would, of course, be an error, for the disallowance of the company's charges added nothing to the return, but merely revealed what the true net return had been. The true net return was, of course, less under the reduced rates. This error, however, if the Court really committed it, would not affect the result; for the first premise doubtless went farther than to hold that the old rates were adequate; the reasons given for so holding are doubtless sufficient to support a holding that rates sufficient to pay the same dividends would be adequate, even if they no longer sufficed for the continued acquisition of new property. If this was the scope of the first premise, the Court's conclusions would unquestionably follow.

The holdings which resulted in the second premise (the disallowance of the company's charges to depreciation) are important, but not for the purposes of revealing the new approach to the question of confiscation. Briefly stated, the company had sought to take advantage of two inconsistent positions: (1) that the actual depreciation was much less than the amount of the depreciation reserve (hence that only the lower amount should be subtracted in finding the "value"), and (2) that the depreciation reserve was not excessive for its purpose. According to the Court, however, "in the face of the disparity between the actual extent of depreciation, as ascertained according to the comprehensive standards used by the company's witnesses, and the amount of the depreciation reserve," "it appears that the depreciation reserve to a large extent represents provision for capital additions, over and above the amount required to cover capital consumption." The company was said not to have sustained the burden of proving that the the Commission's reduced allowances were sufficient.

We come now to the departure from traditional methods in reaching the premise that the old rates were not confiscatory. In holding the Commission's rates invalid, the District Court had made "findings" of valuation, from which it would have followed that the old rates, as well as the reduced ones, were "grossly confiscatory." And this would still hold true even though the estimate of net earnings be revised upward by eliminating the excessive depreciation allowances.

The Supreme Court approached the question from another angle and concluded that the old rates could not be confiscatory, and that the lower court's findings, which would lead to their being so regarded, must accordingly be rejected. In effect, they were conclusively presumed to be erroneous because they did not square with the conclusions reached by the new approach. The reasons for the Supreme Court's conclusion will appear more significant if we first recall the traditional approach to the problem. Beginning with *Smyth* v. *Ames* in 1898 the Court had read into the Fourteenth Amendment a requirement that no state should establish confiscatory rates, and that rates would

be deemed confiscatory if they failed to yield a fair return on the fair value of the property. Later cases definitely held that the property to be valued was not confined to that acquired with the proceeds of the sale of securities, but must include as well that purchased out of earnings from rates lawfully established, however excessive those rates might have been.[5] What has been meant by "fair value" has never been entirely clear;[6] but what has been clear is that it is a figure in the determination of which "due consideration" must be given to the hypothetical cost of reproducing the property at the time when the rates are to take effect, and an undefined element called "going value" added, whenever its existence can be "proved." The "fair value" in any case may be many times the actual cost. If rates were fixed which failed to yield a fair return on all of this "fair value," they would be adjudged "confiscatory no matter how successfully the company might be able to operate under them, and no matter how liberal the dividends it could pay and how good its credit.[7]

[5] See *Board of Utility Commissioners v. New York Telephone Co.*, 271 U. S. 23 (1926—per Butler, J.).

[6] If it refers to the same value which an owner would receive if his property were condemned, thus leaving him in as favorable a position as if no action had been taken, then the rule would obviously nullify any power of the state to correct an evil of rates yielding exorbitant profits; if it refers to value in some less familiar sense, the Court has persistently refused to define it, insisting that it "is not a matter of formulas."

The subject was thoroughly examined in 1920 by the late Gerard C. Henderson, in two articles entited "Railway Valuation and the Courts," 33 *Harvard Law Review* 902 and 1031. He concludes his examination with the following words: "The whole doctrine of Smyth v. Ames rests upon a gigantic illusion. The fact which for twenty years the court has been vainly trying to find does not exist. 'Fair Value' must be shelved among the great juristic myths of history, with the Law of Nature and the Social Contract. As a practical concept, from which practical conclusions can be drawn, it is valueless."

[7] The Supreme Court has continued to pay at least lip service to this doctrine as late as the present year. See, for instance, *Clark's Ferry Bridge Co. v. Public Service Commission*, 54 Sup. Ct. 427, decided February 5, 1934. It has, however, been more insistent than formerly that the company sustain the burden of proving "confiscation"; and it has modified its position on "going value". In *Los Angeles Gas & Electric Corp. v. Railroad Commission*, 289 U. S. 287, decided May 8, 1933, Chief Justice Hughes, speaking for the majority of a divided court, found that the Commission had based its rates on a valuation which (apart from the element of "going value") was excessive by over $5,500,000. There was dispute as to whether the Commission had in fact made allowance for "going value." It had not specified a definite sum as representing that item. Unless the company could prove a "going value" of more than the $5,500,000 by which the rest of the property had been overvalued, the Court ruled that there could be no confiscation; and it held the testimony of the company's witnesses was "obviously too conjectural" for the purpose. The burden on the company to prove the existence of this item in a non-conjectural way would seem to be almost insuperable, in view of the fact that the Court refuses to define "going value" more precisely than by referring to it as the "element of value in an assembled and established plant, doing business and earning money, over one not thus advanced." (Quoting from *Des Moines Gas Co. v. Des Moines*, 238 U. S. 153, 165, decided in 1915.) It also adds that the regulatory authority "is not entitled to treat a living organism as nothing other than bare bones"—a requirement already met when the "physical valuation" is based on anything above scrap value. To make the concept to be proved still less definite, the Court takes pains to point out that "the going value thus recognized is not to be confused with good will," nor does its recognition "countenance a mere attempt to recoup past losses."

In 1926 the Court's attitude had made it less difficult for a company to establish "going value." In *McCardle v. Indianapolis Water Co.*, 272 U. S. 400, decided that year, Mr. Justice Butler, speaking for the majority, quoted a statement by the Commission in a proceeding involving the same company some 11 months prior to the one under review. This statement set forth facts as to the company's prosperity analogous to those which, we shall see, were set forth in the Chicago telephone case, as proving the adequacy of the rates. In the Indianapolis case, however, the facts were used for the opposite purpose—to prove the existence of "going value", on which, to avoid confiscation, the rates must yield a return. Referring to the Commission's statement, Mr. Justice Butler said: "The evidence is more than sufficient to sustain 9.5 per cent. for going value. And the reported cases showing amounts generally included by commissions and courts to cover intangible elements of value indicate that ten per cent. of the value of the physical elements would be low when the impressive facts reported by the commission in this case are taken into account."

The court no longer seems disposed, even when professing to apply the doctrine of *Smyth v. Ames*, to make

(Footnote 7 continued on page 310)

The amount of the dividends and the ability to attract capital depend on the relation between the net earnings and the amount contributed to the company by the security holders, present and future. The amount so contributed would, of course, represent the actual cost of such of the property as was acquired from the sale of securities. But these considerations were not determinative of whether rates were confiscatory. Thus rates quite sufficient to enable a company to operate "with outstanding success" might still be adjudged "grossly confiscatory"—and this through no error in the calculations, but because "confiscation" was determined by a criterion quite other than that of the company's ability to operate successfully.[8] Yet because of the implications which the word still carried, rates which barely exceeded the level of this artificial "confiscation" were still regarded as drastically low. We were told in all seriousness that "rates substantially higher than the line between validity and unconstitutionality properly may be deemed to be just and reasonable, and not excessive or extortionate."[9] The absurdity of the situation was pointed out in 1930 in the very illuminating report of the minority of the New York State Commission on Revision of the Public Service Law (pp. 192-194).[10] After pointing out that the presidents of the Consolidated Gas Company and of the New York Edison Company (both highly prosperous) had each testified that it was the policy of his company to charge rates lower than those to which he claimed it to be constitutionally entitled, the report says:

"We wonder whether these two executives fully realized what a fatal indictment of the whole theory of the 'present value' doctrine they were making when they presented this testimony and expressed this policy. What shall one say of a system of rate regulation which gives to public utility companies the constitutional right, on grounds of protection from actual *confiscation* of their property, to charge higher rates than the Nation's premier gas company and premier electric company find it expedient and necessary to charge in the most prosperous year in public utility

(Footnote 7 continued from page 309)

the company's path quite so smooth in its effort to prove confiscation. As Mr. Justice Cardozo said in the Dayton case on April 30 of this year, "Going value is not something to be read into every balance sheet as a perfunctory addition." (54 Sup. Ct. 647, 656.) This statement he reiterated on May 21, in *Columbus Gas and Electric Co. v. Public Utilities Commission*, 54 Sup. Ct. 763, 769. In neither case was any separate allowance at all made for going value. "Going value" is still undefined, though in the Dayton case Mr. Justice Cardozo, referring generously to the Chief Justice's opinion in the Los Angeles case, remarks that "the decisions of this court show what going value means" (p. 656). Even in the recent cases, however, the Court professes to recognize the company's constitutional right to a fair return on the "value" (including going value) of all its property used in the service; but in the Lindheimer and Dayton cases it belies this profession by refusing to let the company prove that this right is infringed if rates are adequate according to the new standard.

[8] It is true that the Court, in applying the doctrine of *Smyth v. Ames*, has sometimes spoken in terms of attracting capital. Thus, speaking through Butler, J., in *Bluefield Water Works Co. v. Public Service Commission*, 262 U. S. 679 (1923) it said: "The return should be reasonably sufficient to assure confidence in the financial soundness of the utility and should be adequate, under efficient and economical management, to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties."

These remarks, however, were made in connection with the determination of the fair *rate* of return. But the investor from whom the money is raised is not concerned with the rate of the company's return *on any valuation other than the amount he contributes* (i. e., the actual cost), except in so far as he can translate the return on the "fair value" into the return he will get on cost. Yet the Court seemed to assume that if (say) 8% *on the money invested* was essential to attract capital, then the company could not raise the necessary capital without being allowed to earn 8% *on the fair value of the property*—an obvious *non sequitur*.

[9] Butler, J., in *Banton v. Belt Line Railway Corp.*, 268 U. S. 413, 423 (1925).

[10] The minority commissioners were Frank P. Walsh, James C. Bonbright, and David C. Adie. While the report is said to have been prepared by Commissioner Walsh, it bears testimony throughout to Professor Bonbright's thorough grasp of both the theoretical and the practical problems involved.

history? Let it again be remembered that the 'present value doctrine' when first developed by the Courts, was designed to fix the very lowest limit of reasonableness, the constitutional deadline below which a legislature might not go in the exercise of its discretion over railroad or utility rates. Yet here the situation is precisely reversed, and the companies concede that, even without any pressure from the government, and in the exercise of their own business judgment as representatives of the interests of their stockholders, they find it expedient to charge rates that, by their own contention, constitute a 'confiscation' of their property. If this be confiscation, then it is of a kind that stockholders may devoutly pray for."

As if the present Supreme Court had taken these strictures to heart, we find it no longer willing to pronounce rates confiscatory merely because they fail to yield a fair return on valuations made by a District Court. We find the Court in the present case rejecting the lower court's conclusions, not because of any specific error pointed out, but because of a conclusive presumption that the results were erroneous since they conflicted with the implications commonly attached to the word "confiscation." There is no room for the test of *Smyth* v. *Ames*, however accurately it may be applied in the reasons advanced by the Court. They follow in full,[11] with the omission of some footnotes, in order that the reader may check this assertion:

"The financial history of the Illinois Company repels the suggestion that during all these years it was suffering from confiscatory rates. Its capital stock rose from $9,000,000 in 1901, to $70,000,000 in 1923, $80,000,000 in 1925, $110,000,000 in 1927, $130,000,000 in 1929 and $150,000,000 in 1930. Its funded debt, which was somewhat less than $50,000,000 in 1923, continued at about the same amount until 1930. During this period appellee paid the interest on its debt and 8 per cent. dividends on its stock. Its 'fixed capital reserves,' which embraced the depreciation reserve presently to be mentioned, rose from $37,575,004 in 1923, to $63,966,748 in 1930, and to $69,242,667 in 1931. The company's surplus and undivided profits over and above these capital reserves increased from $5,600,326 in 1923, to $22,907,654 in 1930, and to $23,767,381 in 1931. Its 'fixed capital,' that is, the book cost of 'total plant and general equipment,' which was $145,984,084 at the end of 1923, increased to $288,381,090 at the end of 1930, and to $291,259,580 at the end of 1931. We do not lose sight of the fact that this showing embraces the entire business of the Illinois Company, both interstate and intrastate. But it appears that the intrastate investment in the Chicago area approximated 60 per cent. of the entire investment of appellee in the state. The book cost of the plant in service and general equipment in intrastate business in Chicago increased from $95,582,266 at the end of 1923 to $174,160,314 at the end of 1930, and to $177,384,652 at the end of 1931. 'The gross additions' to the company's property in the Chicago area, the company states, 'were spread fairly evenly over the period.' 'The business expanded with great rapidity. The number of telephones in Chicago increased from 690,000 at the end of 1923 to 940,000 at the end of 1931, and was 987,000 at the peak in 1929.' During the nine years 'a greater amount of plant was added new to the property than was in service at the beginning of the term.' The company informs us that the property was kept 'at a high and even standard of maintenance throughout the years involved' and 'was at all times capable of giving adequate telephone service abreast of the art.' The property has been efficiently and economically operated, and the company has enjoyed excellent credit.

"This actual experience of the company is more convincing than tabulations of estimates. In the face of that experience, we are unable to conclude that the company has been operating under confiscatory intrastate rates. Yet, as we have said, the conclusion that the existing rates have been

[11] The Court also noted that in the proceedings before the Commission the company had itself maintained that the old rates "are just and reasonable, and that the burden of proof is upon whomsoever avers, or seeks to show, that said rates and charges are unjust or unreasonable." In the absence of the full context, it would seem to the writer more likely that the company was merely contending that the old rates were *reasonably low*, rather than admitting that they were *reasonably high*.

confiscatory—and grossly confiscatory—would be inescapable if the findings below were accepted. In that event, the company would not only be entitled to resist reduction through the rates in suit, but to demand, as a constitutional right, a large increase over the rates which have enabled it to operate with outstanding success. Elaborate calculations which are at war with realities are of no avail. The glaring incongruity between the effect of the findings below as to the amounts of return that must be available in order to avoid confiscation and the actual results of the company's business makes it impossible to accept those findings as a basis of decision."

All that the Court says of the company's financial history is quite consistent with a finding that it was receiving less than a fair return *as calculated by the standard of Smyth* v. *Ames*; the financial history is not at war with the lower court's findings, *based on the traditional formula*. The traditional formula had been evolved on considerations most of which had nothing whatever to do with any of the factors enumerated in the lengthy passage we have quoted to indicate the company's prosperity. What is at war with the realities is the traditional standard itself, with its implication that rates which do not measure up to its exacting requirements are confiscatory in the sense of being drastically low. It is indeed absurd to give to the word "confiscatory" this double meaning. Yet this is precisely what the Court has hitherto done. The present decision in effect rejects the first meaning when it cannot be reconciled to the second. It does not recognize with the frankness of the minority of the New York Revision Commission that this implies "a fatal indictment of the whole theory of the 'present value' doctrine." Perhaps that will be the next step.

In the Dayton case (the other decision of April 30 to which we referred at the outset) the Court again announced a preference for the common sense meaning of "confiscatory," though the rates in that case were declared non-confiscatory by either test. The Court upheld an order of the Ohio Commission which refused to permit an increase in natural gas rates. The opinion was by Mr. Justice Cardozo. Justices Van Devanter and Sutherland took no part in the case. Justices McReynolds and Butler concurred in the result (without opinion). After concluding that the company had failed to show that the rates without the increase were insufficient to yield a fair return on the value, Mr. Justice Cardozo added:

"But the conclusion has reinforcements from other avenues of approach. In a statement put in evidence by the appellant, the rate of return under the new schedule is said to be 128/100 per cent. of the fair value of the property. Under the earlier schedule the revenue was even less. So modest a rate suggests an inflation of the base on which the rate has been computed. It is a strain on credulity to argue that the appellant, when putting into effect a new schedule of charges, was satisfied with one productive of so meager a return . . . The argument proves too much; the valuations are discredited by the teachings of experience. Men do not transact business without protest at confiscatory rates, at all events in the absence of extraordinary circumstances making submission to the loss expedient. If such circumstances exist, the appellant has not proved them. Nothing in the record lays the basis for a belief that the natural gas business in Ohio is unable to pay its way. That being so, what the public utility has done belies what it has said. We shall hardly go astray if we prefer the test of conduct."

The test of conduct, it should be noted, does not contradict the conclusion that the rates were confiscatory in the old and artificial sense, for in that sense men would not hesitate to transact business at given rates merely because they were confiscatory. The test of conduct proves only that the rates were not

confiscatory according to any standards other than the artificial, traditional one.

Since the Court prefers conclusions reached by these "other avenues of approach" to those reached by the avenue of *Smyth* v. *Ames*, the use of the latter would prove futile to litigants provided the new avenues are available. The conclusions reached according to the *Smyth* v. *Ames* doctrine would either be rejected or they would prove superfluous. Should the Court improve the new avenues by further definition and elaboration, and should it post a notice that the avenue of *Smyth* v. *Ames* is closed to traffic, then all the expense, labor, and confusion attendant on the use of that road could be saved. At the same time rates could be regulated on a far more practicable basis.

On March 5, in *Nebbia* v. *New York*, the Supreme Court boldly repudiated the superstition that "there is something peculiarly sacrosanct about the price one may charge for what he makes or sells." It insisted that the Fourteenth Amendment no more makes a state regulation of this price unconstitutional, merely because the business is not within a closed category "affected with a public interest," than it makes other regulations of property unconstitutional when the business is outside that category. But if there is nothing peculiarly sacrosanct about the price one may charge, what is there in the Fourteenth Amendment that makes a state regulation of the price *per se* unconstitutional, when it has the effect of depriving the owner of a fair return on the fair value, although a different sort of regulation of the property, having the same effect, would be quite valid? Should the Court dispose as boldly of the "fair value" myth (which it has already undermined) as it has disposed of the myth of "businesses affected with a public interest," it would then be in a position to confine its attention to realities when it performs the function attributed to it by Mr. Justice Roberts in *Nebbia* v. *New York*—"to determine in each case whether circumstances vindicate the challenged regulation as a reasonable exertion of governmental authority or condemn it as arbitrary or discriminatory."[12] What is perhaps more important, the commissions would be emancipated from the baffling and expensive task of regulating rates with reference to utterly unreal and hypothetical "valuations."

ROBERT L. HALE.

[12] 54 Sup. Ct. 505, 515 (1934).

The Johnson Bill

ONE of the most controversial questions in the public utility field arose from the practice of the lower federal courts in entertaining suits to enjoin commission rate orders.

Our opinion is that the problem was solved and one of the biggest stumbling blocks in the way of public utility regulation removed when, after it had been before Congress at several sessions and in various forms, the Johnson Bill[1] was

[1] An Act to amend section 24 of the Judicial Code, as amended, with respect to the jurisdiction of the district courts of the United States over suits relating to orders of State administrative boards.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that the first paragraph of section 24 of the Judicial Code, as amended, is amended by adding at the end thereof the following: "Notwithstanding the foregoing provisions of this paragraph, no district court shall have jurisdiction of any suit to enjoin, suspend, or restrain the enforcement, operation, or execution of any order of an administrative board or commission of a State, or any rate-making body of any

(Footnote 1 continued on page 314)

finally passed by the 73rd Congress.

This act takes away from the federal district courts their jurisdiction over suits to restrain or enjoin rate orders entered against public utilities by any official body having regulatory authority over public utilities. As originally introduced, the act applied only to suits to enjoin the orders of state commissions, but it was subsequently amended to include the orders of municipalities or of any other political subdivisions of the state, since a number of cities have jurisdiction over all or some of the utilities serving them.

The act sets forth three conditions which must be met in order to deprive the district courts of jurisdiction over these cases. These are designed to protect the substantive rights of the utilities. They are (1) that the order shall be a rate order; (2) that it shall not interfere with interstate commerce; and (3) that it has been made after reasonable notice and hearing and that a plain, speedy, and efficient remedy may be had at law or in equity in the courts of the state. As a practical matter, the federal court itself will be the judge as to whether or not these three conditions have been met, since, if a suit is filed to restrain a commission order, the commission, in order to invoke the provisions of the Johnson Act, will be obliged to appear and pray a dismissal on the ground that the court does not have jurisdiction. Such action by the commission will necessarily involve a decision by the district court as to whether provisions of this act are applicable.

The constitutionality of the Johnson Bill has never been seriously questioned, in view of the case of *Kline* v. *Burke Construction Co.*[2] in which the Supreme Court said:

"The right of a litigant to maintain an action in the federal court on the ground that there is a controversy between citizens of different states is not one derived from the Constitution of the United States, unless in a very indirect sense. Certainly it is not a right *granted* by the Constitution. The applicable provisions, so far as necessary to be quoted here, are contained in article 3. Section 1 of that article provides: 'The judicial power of the United States shall be vested in one Supreme Court, and in such inferior courts as the Congress may from time to time establish.' By section 2 of the same article it is provided that the judicial power shall extend to certain designated cases and controversies and, among them 'to controversies . . . between citizens of different states . . .' The effect of these provisions is not to vest jurisdiction in the inferior courts over the designated cases and controversies but to delimit those in respect of which Congress may confer jurisdiction upon such courts as it creates. Only the jurisdiction of the Supreme Court is derived directly from the Constitution. Every other court created by the general government derives its jurisdiction wholly from the authority of Congress. That body may give, withhold or restrict such jurisdiction at its discretion, provided it be not extended beyond the boundaries fixed by the Constitution."

Thus, since the Congress has power to create and define the jurisdiction of the lower federal courts, the argument

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(Footnote 1 continued from page 313)

political subdivision thereof, or to enjoin, suspend, or restrain any action in compliance with any such order, where jurisdiction is based solely upon the ground of diversity of citizenship, or the repugnance of such order to the Constitution of the United States, where such order (1) affects rates chargeable by a public utility, (2) does not interfere with interstate commerce, and (3) has been made after reasonable notice and hearing, and where a plain, speedy, and efficient remedy may be had at law or in equity in the courts of such State."

Sec. 2. The provisions of this Act shall not affect suits commenced in the district courts, either originally or by removal, prior to its passage; and all such suits shall be continued, proceedings therein had, appeals therein taken, and judgments therein rendered, in the same manner and with the same affect as if this Act had not been passed. (S. 752, approved May 14, 1934.)

[2] 260 U. S. 226 (1926).

is reasonable that it also has power to delimit the jurisdiction of any lower federal court, if it so chooses.

Objectives of the Johnson Bill

Two principal objections have been raised against federal judicial review of commission orders: one is based on the long delays which had resulted in most of the important cases that had been taken from commissions into the federal courts; and the second is the added expense which the state was forced to bear when restraining proceedings were begun in the federal court. As a practical proposition, the second of the two is probably the more potent objection, since after large amounts of money had been spent in investigation by the technical staffs of the commission, the practice was to grant a trial *de novo* in the federal court. This resulted in the matter being referred to a master and exactly the same procedure, which had already been gone through once by the commission, repeated. Although we have no quarrel with the fitness of the masters selected by the various federal courts, nevertheless, it seems ridiculous, once matters of fact had been decided by a body trained to decide just such problems as these, that the same grounds should be gone over by an individual who had rarely had as much experience in cases of this kind as the commission. In addition, there was the large item of expense which had to be borne in this trial *de novo*, since the utilities, knowing that the expenses would ultimately be paid by the ratepayers, spent huge sums in hiring expert witnesses to testify in rate cases. The state, therefore, was under a duty, if not to produce as many expert witnesses as the utilities did, certainly to produce men whose qualifications were such as to enable their testimony to be entitled to the same weight as the testimony of the utilities' experts. This necessitated the expenditure of large sums of money which the state could ill afford. The result, of course, was that the same people as taxpayers and as ratepayers paid for both sides of the lawsuit.

A further evil was that, since the case would at the option of the utility company be tried *de novo* before the federal court, it was not necessary for the utility to produce all the facts before the commission. Where the investigating staff of the regulatory body was not large enough or not sufficiently active to uncover the details, the commission in many cases (when the matter was heard in the federal court) found itself confronted by new facts which changed the whole picture, with the result that the court was deciding an entirely different case from the one presented to the commission.

The Johnson Bill would seem to force the utility to introduce evidence as to all the pertinent facts before the commission or else be foreclosed from presenting facts, except in those few states where new evidence may be presented.

In the majority of the state courts the practice is entirely different. In 43 of the 47 states having commissions a review of the state commission order is had upon the record made before the commission. In some of them additional evidence may be introduced on appeal, but ordinarily in such case the law requires that it be certified back to the commission for its reconsideration and action thereon, so that the final action of the court on appeal with respect to an order of the commission is had upon exactly the same record as the commission had before it in making its decision.[3]

[3] Jurisdiction of the United States District Courts on Suits Relating to Orders of State Administrative

(Footnote 3 continued on page 316)

In the states of Georgia, Massachusetts, South Carolina, and Texas, actions to review a commission order appear to be *de novo* and it is not clear to what extent the record before the commission is used. Delaware, of course, is the state without a commission.

As a result of these conditions the state procedure is, of course, far less expensive in a rate case than the federal court procedure and the removal of this burden from the state was one of the major objectives of the bill.

It has been argued that practically the same result would have been reached had the Johnson Bill provided only that the record before the commission should have the same weight and effect in the federal court that it had in the state court. However, the sponsors of the bill were not of that opinion nor are the majority of the utility commissions of that opinion. The Lewis substitute bill would have preserved the jurisdiction of the district courts, but this bill provided that, in any suit to enjoin a state commission rate order, the hearing and determination would be upon the record before the commission except that upon application of any party the court might take additional evidence if "such party was by the board or commission denied the opportunity to adduce such evidence." The Lewis bill was overwhelmingly defeated. One of the reasons advanced by the National Association of Railroad and Utilities Commissioners in urging the defeat of this substitute was that the substitute bill failed to attach any presumption of reasonableness to findings of fact made by the state commission; and, since the rate order of federal rate-making agencies gave rise to such presumptions, the Lewis substitute would subject orders of state commissions to disadvantages from which the federal rate-making agencies are free.

The other argument advanced by the proponents of the bill, that the long delays in federal court proceedings were crippling utility regulation, is so clear as to be obvious. Felix Frankfurter has said that the "present enfeeblement of utility administration by the states is in no small measure due to interference in administration by the lower Federal Courts."[4]

Several cases in the past have led to almost unbelievable delays in the enforcement of commission rate orders where the matter was taken into the federal court. Perhaps the outstanding case in this respect was *Lindheimer* v. *Illinois Bell Telephone Co.*[5] where the commission's order was entered in 1923; the matter was before the United States Supreme Court on three separate and distinct occasions and finally, after 11 years of litigation, the Supreme Court upheld the commission's order and the company is preparing to make refunds of some millions of dollars. The result of these delays was not only to deprive consumers of rate reductions to which they were entitled but commissions, confronted by obvious long delays, resorted to bargaining with the utilities in rate cases. In other words, commissions have entered agreed orders for a smaller reduction than probably could have been sustained as constitutional in return for the utility's promise not to appeal from said order, because the commission realized the possibility, even the probability, that the utility, by proceedings in the federal court, could prevent enforcement of the rate order for a long period.

(Footnote 3 continued from page 315)

Boards—Hearing Before Committee on Judiciary, House of Representatives, February 27, 28, and March 1, 1934, p. 217.

[4] Frankfurter, *The Public and Its Government* (New Haven: Yale University Press, 1930).

[5] 78 U. S. Rep.—(1934).

Opposition to the Bill

The opponents of the Johnson Bill attempted to answer both of the arguments stated above by pointing out how few cases involving commission orders went to the federal courts, and the following table was presented to the House Judiciary Committee by Mr. Charles W. Kellogg, Chairman, Engineers Public Service Company, New York:

Replies to this questionnaire were received from the commissions of 21 states, representing an average experience of over 16 years, or an aggregate experience of 343 commission years. The gist of the answers to the questionnaires is as follows:

Total number of formal cases during the period	142,704
Total number of such cases appealed to any court	1,497
Appeals to state courts	1,389
Appeals to federal courts	108
Total number of appeals by commissions themselves	38
Total number of rate cases included in above appeals	318
Total number of cases involving valuation among the above appeals	177

The table alone does not present a true picture of the situation. The states which were numbered among the 21 from which reports were received were probably representative. Nevertheless, the 108 cases which the table shows to have gone to the federal court were nearly all rate cases and the same questionnaire shows that during that period 177 of the total of 318 rate cases involved valuation.

In comparing the figure 108 with the total number of cases appealed (1,497), it must be remembered that rate cases are the most important of the appeals taken from commission orders. They affect more persons and go to the very essence of state regulation of public utilities.

Opponents of the bill also objected that a remedy had already been provided for the evils which existed in the former practice. They argued that Rule 266 of the judicial code provided, substantially, that in any case where an application for a temporary injunction was made to the federal court and the commission appealed to the state court and the state court granted an order to stay the commission's order, upon application to the federal court and proof that such a stay order has been entered, further proceedings in the federal court would be stayed. However, several fallacies appear in this argument. First, only a very few commissions could appeal to their state courts in that situation since such a right has to be given to them by statute. Second, the federal court had decided that the rule had no application where a temporary restraining order had been granted by the federal court, since in that case the proceedings in the state court would be a violation of the federal court's restraining order.[6] And third, there was a real question as to whether the federal proceedings were permanently stayed or only temporarily stayed pending the decision of the state court in the matter, and, if it was decided that they were only temporarily stayed, the utility could have its state appeal and, if defeated there, could then resume its federal proceedings.

Although Rule 266 was adopted in 1913, in only very few cases have the commissions availed themselves of it. One of these cases was the celebrated Mondovi Telephone Company case, decided in Wisconsin in 1932. In 1931 the Wisconsin Legislature had passed a statute empowering the Commission to appeal to the courts from its own orders and giving the courts the power to grant a stay order against the order of the

[6] *Union, etc., Co. v. Commission*, 17F. (2d) 143 (1926).

Commission. When, in the Mondovi case, the utility applied for a temporary injunction and the court required the utility to give notice to the Wisconsin Commission, that Commission hurriedly appealed to the state court, secured a stay order, and the federal court was forced to stay its own proceedings in accordance with the provisions of Rule 266.

There is something in the argument of opponents of the Johnson Bill that the long delays which had been experienced in some cases were not attributable to the fact that proceedings were had in the federal court, but that similar delays would be encountered in appeals to the state court. Only time and experience will determine what the results as to time consumed in appeals will be in the state courts, but it seems clear that delay will be lessened since the reviewing court will not have to take time to hear evidence, such as was necessary when the federal court tried the matter *de novo*.

The utilities insisted that the Johnson Bill really amounted to depriving them of a substantive right—namely, the right of appeal to the United States Supreme Court. When they had the power to go into the federal court to secure an injunction or restraining order, there was an unconditional right of appeal to the United States Supreme Court from the decision or order of the statutory court. It is true that now they are limited to their appeal to the state court and they will, of course, be treated as are other litigants in state courts seeking to appeal to the United States Supreme Court. Since 1925 the Supreme Court has heard cases from the state supreme courts only on writ of *certiorari* and said writ is discretionary. Therefore, the Supreme Court may very well refuse to hear a given case, whereas under the old practice the utilities were certain that if they so desired the United States Supreme Court would be the final arbiter in the matter.

However, even this argument should be discounted since its support depends largely on the theory that the United States Supreme Court, in refusing to allow an appeal from a state supreme court in a rate case, will act arbitrarily. For, if the court acts with sound discretion, and we have no reason to doubt that it will so act, it will decide in passing upon the question as to whether or not a writ of *certiorari* should be granted upon the justification of the utility's position in the matter and, if the writ is denied, we can be reasonably certain that there is no justification for the utility's contention.

Conclusion

It is extremely difficult even to attempt to forecast what the effect of the Johnson Bill will be. Certainly there should be a pronounced saving in money by those state commissions which are now engaging themselves in campaigns to reduce rates. It is our opinion that the results reached in the state courts will be substantially the same as those reached by the federal courts, since the same precedents—namely, the decisions of the United States Supreme Court—will be the leading authorities in the state courts as they were in the federal courts. Likewise, the unspoken argument of the utilities, to the effect that the state courts would be more lenient with the commissions than the federal courts were, seems to have no merit. Even though this amounts to a slur on the state judiciary, nevertheless its utter absurdity makes an answer to the argument unnecessary.

Likewise, there is the fact that in many states, as in Illinois, it is not only necessary that a commission order when

appealed to the state court must be sustainable substantively but likewise must be invulnerable against attacks on formal grounds, and there are a number of cases, in Illinois particularly, in which commission orders have been reversed for failing to meet formal requirements which the Illinois Supreme Court has said were necessary.

It is our opinion that the Johnson Bill will be of real and vital assistance to utility regulation in that it obviates the the delays incidental to a trial *de novo* in the federal court and cuts materially the expense to which state agencies were put in defending suits to enjoin commission rate orders.

IRVIN ROOKS.

Book Reviews

BABCOCK, FREDERICK M. THE VALUATION OF URBAN REAL ESTATE. *New York: McGraw-Hill Book Co., Inc., 1932. pp. xi, 593. $5.*

This volume, which is a very comprehensive treatise on practically all phases of the appraising of real estate from the economic point of view, is a distinct contribution to appraisal thought.

The practical value of the volume is materially emphasized to the reader by the author's very frank statement that appraisal technique, although often assumed to be correct, can do no more than remove the most glaring inaccuracies of pure guesswork.

Very helpful and interesting presentations are contained in this volume on such subjects as, the difference between price and value, types of data required for sound appraisals, district trends, population growth, the influence of social and racial factors on value, architecture and its relation to value, earning expectancy, occupancy, risk and interest rates, land value by comparison, the difference between market value and warranted value, cost estimation of buildings, plottage, and the economic mortality of buildings where the author discusses several fallacies existing in general thought on this subject.

In discussing the characteristics of land, a very sound reference is made to the common error of valuing all vacant sites on the basis of their highest and best use, notwithstanding the fact that such improvement would destroy the value of all land.

Reference is made to the method of valuing semi-rural and border lands suggested by Herbert D. Simpson and John E. Burton in *The Valuation of Vacant Land in Suburban Areas.*

The author comments quite soundly that the dictation of proper appraisal procedure by statutes, court decisions, and regulatory bodies, based upon the practice used in the community from time to time in the past, and allowing such procedures to become permanent, unchangeable dicta is irrational.

The presentation in the chapter on management and income is rather weak.

The author's presentation of depreciation and obsolescence factors is excellent. The problem of the appraiser as contrasted with that of the accountant, a distinction which has caused much controversy, is intelligently discussed.

The need for taking into account the future anticipated income in the appraisal of income properties is also presented. The author emphasizes this matter by pointing out that the difficulty of making predictions in no wise modifies the necessity for making them.

The "axioms of value" are presented in one chapter in a form which it would be worth while for any appraiser to memorize. There is also a chapter on the "mathematics of valuation", dealing with compound interest functions and the mathematics of probability.

In his reference to wholesale appraisal methods, the author does not give credit for substantial improvements in methods made in some localities which have permitted the introduction of economic principles into what was formerly purely summation (land plus reproduction cost of buildings).

In the actual making of valuations, the author lists and discusses seven methods of procedure applicable to various types of real estate. Inaccurate methods are also listed. More than 100 actual examples of valuations are included.

The author has introduced into this volume two innovations: (1) rate charts have been constructed so that given conditions selected on the chart will automatically indicate a capitalization rate; and (2) annuity tables have been prepared in such a way that the various rates of interest are adjusted to reflect automatically three different premises of declining income flow. Although the ideas here presented have merit, these charts and tables lose much of their practical value and are, in fact, likely to be misleading, since they seem to be based upon empirical curves, representing arbitrary individual opinion, rather than upon a broad and comprehensive study of competent data.

The various purposes for which valuations

are made are presented completely and with a considerable amount of detail.

The last chapter deals with the "accuracy of valuations" where the author again denies the possibility of exact valuation with the statement that, at best, real estate valuations are rather low in accuracy.

This is most assuredly a volume which should be carefully read by all persons interested in real estate valuation and the economic principles involved.

WALTER R. KUEHNLE.

Greenwood, Ernest. THE GREAT DELUSION. *New York: Harper and Bros., 1933. pp. xix, 232. $2.50.*

In the last several years public utilities, particularly the electric light and power industry, have been severely criticized from many points of view. As a result, the system of public regulation of utilities has been strengthened somewhat in several states, and the discussion of public ownership, as an alternative to private ownership, has been considerably enlivened. Since the first important revelations of the Federal Trade Commission in its investigation of electric power companies the private utilities have not generally answered their critics. During the last year or so, however, there has been a rising sentiment in the industry for an outspoken counterattack. This has resulted in considerable sniping here and there, and an entrenchment by abandonment of the old trade association, but these tactics have not materialized in a defense worthy of respectful consideration.

Here is a book which tries to make such a defense. But in the opinion of the reviewer, it does not succeed. Mr. Greenwood's book undertakes to show that public ownership is a great delusion. He proceeds by pinning the socialist label upon advocates of more public regulation and ownership, by advancing the customary N. E. L. A. arguments that public ownership is doomed to failure (except in phenomenal exceptions), and by defending the regulatory system as it has worked in the past. For good measure the author includes a discussion of socialism and communism, insurance, oil production, the Alaska Railroad, and "Irrigation Sense and Nonsense," with conclusions highly damaging to governmental regulation and ownership.

HUBERT F. HAVLIK.

Wray, Charles H. REAL ESTATE SUBDIVIDING IN NEW JERSEY: With Special Reference to Middlesex County. *New Brunswick: Rutgers University, Bureau of Economic and Business Research, 1932. pp. 178. $2.00.*

At a recent Housing Conference, a former member of the staff of the Institute for Economic Research addressed himself to the obstacles in the way of low-cost housing created by wild-cat land subdivision. He was accosted afterward by an internationally known city planner, recently returned from a sojourn abroad, who praised the speaker for the first public utterance he had heard recognizing these evils. If the planner is right and if these ideas are still a secret of a few land economists, then there cannot be too many studies such as Mr. Wray's, telling the story over again, with pointed examples in every state from New Jersey to California.

Mr. Wray has written a good 40-page article, with several telling photographs of swamps sold off a generation ago as building sites, and a magnificent seven-story luxury hotel (covered by a defaulted bond issue) alone and deserted on the upper reaches of Toms River. He then prints 95 pages of tables, listing all subdivisions in Middlesex County, town by town; and 12 pages of replies from presidents of local real estate boards all over the State to a questionnaire on subdivisions. If the work sheets, which are of practically no interest to anyone, had been omitted, this bulletin could have been sold for fifty cents instead of two dollars, but it would not have looked so scientific. The statements by the realtors range from intelligent, enlightened criticism of bad subdivision practices to complacent reports, deprecating sporadic "premature" developments in their territory.

CHARLES S. ASCHER.

Clayton, C. F. and Peet, L. J. LAND UTILIZATION AS A BASIS OF RURAL ECONOMIC ORGANIZATION. *Burlington, Vt.: Vermont Agricultural Experiment Station, 1933. Bulletin 357. pp. 144 and plates.*

The authors of this bulletin have carried rural land classification beyond the physical and economic factors which have permitted a classification of land as fit and unfit for agricultural use. Certain minimum income requirements have not been set up as a basis for classifying the land, but rather the

human reaction to certain income conditions has been traced and analyzed. From these past reactions future possibilities in modifying the relation of the population to the land have been outlined.

This knowledge of the human factors involved, which was not in some of the earlier studies by Peck, Frank, and Eke in West Virginia or by Clayton and others in Kentucky, has permitted conclusions beyond those of earlier studies. An actual reform in the use of the land has been recommended. A practical and feasible land program can result therefrom. Much information of a national character has been drawn upon in making the final conclusions. Studies of this character are apparently necessary to give the proper perspective to any agency placed in charge of reorganizing present land use.

The first part of the bulletin is devoted to physical characteristics of the 13 hill towns under study. "Physical characteristics" as here used is broader than merely climate, soil, and topography. It covers, in addition, the number of farms and their location as well as distances from market, condition of roads, past shifts in the use of land, and a description of the type of farming by soil types and locations. A survey of all farms in the 13 towns was made, thus permitting discussion in absolute figures rather than in percentages which arise from sampling.

The conclusions drawn from part one are as follows: (1) Agriculture has declined from operated to partly operated and then to abandoned farms; (2) The few farms which continue are usually located on the most productive soils; (3) The farms more distant and on poor roads are seriously handicapped in the main enterprise of dairying; (4) When a community starts to disintegrate, the timber is usually stripped, making recovery difficult if not impossible.

The balance of the bulletin treats the matter of population in a broad way with reference to migration, ages, and employment and then returns to a rather intensive classification of the land, taxation, indebtedness, farm income, and other sources of public and private income. National economic and social trends are brought into the discussion, where required, to permit conclusions with respect to a suitable land utilization program. The main lines of land planning procedure, derived as conclusions from facts presented, include: (1) concentration of population on the better quality and better located lands; (2) protection and development of the forest resources of the area; (3) development of the water power resources in combination with flood control; (4) a limited reorganization of local government; (5) continuation of extension work in farm management, farm and woodlot management, and the development of cooperative organizations.

The bulletin concludes with a discussion of practical methods for putting into effect these programs as well as other subsidiary enterprises which are possible.

PAUL A. EKE

Veatch, J. O. AGRICULTURAL LAND CLASSIFICATION AND LAND TYPES OF MICHIGAN. *East Lansing: Michigan State College, 1933. Agricultural Experiment Station Special Bulletin No. 231, pp. 51.*

In this monograph the author divides the lands of Michigan into nine major land types, some of which are further subdivided into minor groups. These types and subtypes represent more or less definite combinations of the physical features which determine a landscape, such as soil, topography, drainage, and native vegetation. The author presents an outline map showing nine economic-geographic divisions of the State, which are an aid in interpreting the natural land types in economic terms.

A large part of the paper is given over to a brief description of the character of each of the soil series recognized in the State by the Soil Survey together with general statements regarding their agricultural value, use, and distribution. Presumably these statements regarding land use represent a summary of the author's observations supplemented with actual data on yields in so far as they were available. Professor Veatch then lays down the characteristics of the ideal agricultural land type and presents a large map of the State, showing the general distribution of first, second, and third class agricultural land. Boundaries are not shown between the classes; their distribution is indicated in general by the use of colored dots, each dot representing about 2,300 acres. A tabulation shows that the several counties vary from 0 to 75% first class agricultural land, from 13 to 71% second class land, and from 1 to 86% third class land. The distribution of these classes on the map was determined from soil survey

maps whenever available, from maps of the surface geology, from personal notes of the author, and from other sources.

Using as samples the areas in which the detailed soil survey has been made, the author constructs a table to show the approximate use of each of the three classes of land for various crops. He concludes that there exists considerable land of the first class still unused, that only limited areas of third class land should be brought into use, and that occasional areas of second class may be brought into use, especially for sustenance farming.

It must be emphasized, as the author points out, that the land is considered in reference to the single use-group—crop land. Land not suitable for crops would naturally fall into other use-groups, such as forestry, recreation, grazing, mining, and urban development. Usually such might be the case but actually to classify land it must first be placed into its most economic use-group and then rated within that use-group according to the experience of people using such land. Further, in classifying land much depends upon the market facilities in relation to each small unit of land, in addition to the general conditions over a large area. These criticisms do not effect Mr. Veatch's paper for the purpose of indicating the general areas suitable for crop production.

Such a map of the lands of a state is a valuable contribution to a knowledge of the general conditions and will be useful in codifying any general land policy for the area. The reader must clearly bear in mind that the author does not present a detailed map to be used for the consideration of specific farm problems or for such enterprises as county zoning. It shows the general areas where special problems of land utilization may exist.

CHARLES E. KELLOGG.

DURYEE, WILLIAM B. A LIVING FROM THE LAID. *New York: McGraw-Hill Book Company, Inc., 1934. pp. viii, 189. $1.50.*

This book, by the Secretary of Agriculture of the State of New Jersey, is intended as a simple handbook for those contemplating flight from the city. It suggests briefly the factors to consider in the choice of a small farm, and the opportunities in bee-keeping, poultry raising, milk production, and roadside markets as supplements to the family income. An interesting feature is the list of "Do's" and "Don't's" at the end of each chapter.

As a non-agricultural city dweller I note the following points:

1. If he will avail himself of the proffered guidance, the prospective small farmer will find, all worked out for him, answers to even such questions as how many ounces of vegetable seed to buy for a family of six.

2. It takes capital to flee from the city. Mr. Duryee makes clear at every turn the special equipment needed for efficient production; the feed and rations that must be bought. If you really want to make a *living* out of poultry farming, you will need $10,000 capital.

3. What with a three-page list of common pests to fight in his garden, and germs in wait to kill his cow, chickens, or goat, the homesteader needs more than a pure heart and a strong arm.

4. How many of us can hope to supplement our income by selling vegetables to the rest of us at roadside markets; and how will the non-agricultural motorist like Mr. Duryee's advice to use roadside signs plentifully to advertise the market?

This book attempts only to set up danger signals. It would reach those who need it much better if it were issued as a pamphlet for 50 cents, instead of as a formidable volume at three times that price.

CHARLES S. ASCHER.

DAUGHERTY, CARROLL R. LABOR PROBLEMS IN AMERICAN INDUSTRY. *Boston: Houghton Mifflin Co., 1933. pp. xviii, 959. $3.50.*

As indicated by its 959 packed pages, this newest addition to the list of works presenting a broad survey of the field of American labor problems is cast in a heroic mold. Nowhere else, perhaps, can so much factual and interpretative material pertaining to this ramifying subject be found within the covers of a single volume. Probably the book might have profited by greater condensation and somewhat better integration; but for many students and teachers such concentration of material will have its uses, especially when accompanied by a readable style and a point of view which attempts to be scientific without being colorless.

The 30 chapters are arranged under three major headings: the introduction, including

psychological and historical background material; the treatment of labor problems proper, which is focussed upon the five main factors of insecurity, wages and income, work periods, sub-standard workers, and industrial conflict; and the attempts to solve these problems on the part of labor organizations, employers, and the state. The section dealing with trade unions is unusually long, and virtually constitutes a sizeable book on trade unionism within a book on labor problems. Social insurance, on the other hand, receives relatively meager treatment.

The position of labor in the public utility field is discussed briefly with special reference to the relationship between average real wages and physical productivity per employee, and the right to strike. With the exception of the telephone industry, productivity since the War has increased more rapidly than real wages, and in the electrical industry this discrepancy is particularly glaring. In the author's opinion, there is much to be said for restricting the right to strike on the part of workers in the public utilities, but only if such restriction is accompanied by compensating hour and wage differentials and greater job security.

ELMO P. HOHMAN.

Books Received

THE AGRICULTURAL EMERGENCY IN IOWA, by the Staff in Economics at Iowa State College. *Ames: Collegiate Press, Inc., 1933. pp. x, 201. $ .75.*

THE AMERICAN RAILROAD IN LABORATORY. *Washington: American Railway Association, 1933. pp. 544.*

Batson, H. PRICE POLICIES OF GERMAN PUBLIC UTILITY UNDERTAKINGS. *New York: Oxford University Press, 1933. pp. xx, 224. $3.75.*

Bemis, Albert Farwell. THE ECONOMICS OF SHELTER. *Cambridge, Mass.: The Technology Press, 1934. pp. xxxvii, 605. $4.*

Black, Russell Van Nest. PLANNING FOR THE SMALL AMERICAN CITY. *Chicago: Public Administration Service, 1933. pp. 90. $1.*

Daggett, Stuart. RAILROAD CONSOLIDATION WEST OF THE MISSISSIPPI RIVER. *Berkeley: University of California Publications in Economics, 1933. Vol. 11, pp. 127-256. $2.*

DEMOLITION OF UNSAFE AND UNSANITARY HOUSING: AN OUTLINE OF PROCEDURE FOR A COMPREHENSIVE PROGRAM. *Chicago: National Association of Housing Officials, 1934. pp. 35. 25 cents.*

Dimock, Marshall E. BRITISH PUBLIC UTILITIES AND NATIONAL DEVELOPMENT. *London: George Allen & Unwin, Ltd., 1933. (Distributed in the United States by University of Chicago Press). pp. 349. $3.25.*

Graham, Willard J. PUBLIC UTILITY VALUATION. *Chicago: University of Chicago Press, 1934. pp. 95. $1.*

Graziadei, Antonio. LES VARIATIONS DE LA RENTE ET LA PROPRIÉTÉ DE LA TERRE. *Paris: Les Editions Rieder. pp. 185.*

Green, William Raymond. THE THEORY AND PRACTICE OF MODERN TAXATION. *Chicago: Commerce Clearing House, Inc., 1933. pp. vii, 266. $2.75.*

Hoyt, Homer. ONE HUNDRED YEARS OF LAND VALUES IN CHICAGO. *Chicago: University of Chicago Press, 1933. pp. xxxii, 519. $5.*

Macintosh, W. A. PRAIRIE SETTLEMENT: THE GEOGRAPHICAL SETTING. *Toronto: Macmillan Co., 1934. pp. xv, 242.*

MacMahon, Edna C. MUNICIPAL ELECTRIC PLANT MANAGERS. *Chicago: Public Administration Service, No. 38, 1934. pp. 40. 60 cents.*

Perry, Clarence Arthur. THE REBUILDING OF BLIGHTED AREAS. *New York: Regional Plan Association, Inc., 1933. pp. 59. $2.*

PUBLIC HOUSING SURVEYS: AN OUTLINE OF SURVEY AND PLANNING PROCEDURE FOR LOW-COST HOUSING. *Chicago: National Association of Housing Officials, 1934. pp. 20. 25 cents.*

STATE LAWS FOR PUBLIC HOUSING: A MEMORANDUM ON THE DRAFTING OF ENABLING ACTS FOR PUBLIC HOUSING AGENCIES. *Chicago: National Association of Housing Officials, 1934. pp. 19. 25 cents.*

Timoshenko, Vladimir P. WORLD AGRICULTURE AND THE DEPRESSION. *Ann Arbor: Michigan Business Studies, 1933. Vol. V, No. 5. pp. 123. $1.*